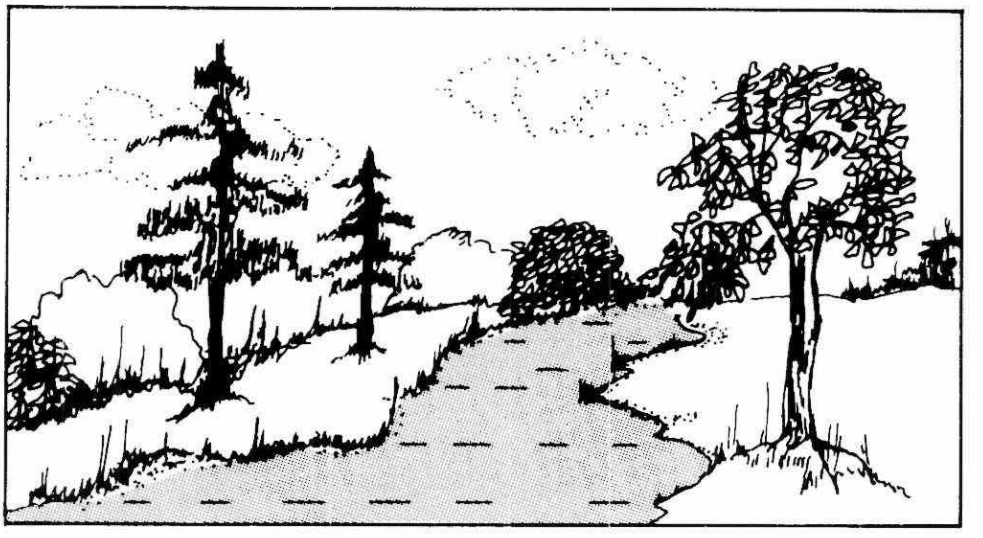
MINISTRY OF THE ENVIRONMENT

Ontario

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY PART 1 SOUTHEASTERN REGION



WATER AND EARTH SCIENCE ASSOCIATES LTD.
CONSULTING HYDROGEOLOGISTS, OTTAWA.
IN ASSOCIATION WITH
GORE & STORRIE LIMITED
CONSULTING ENGINEERS, OTTAWA.

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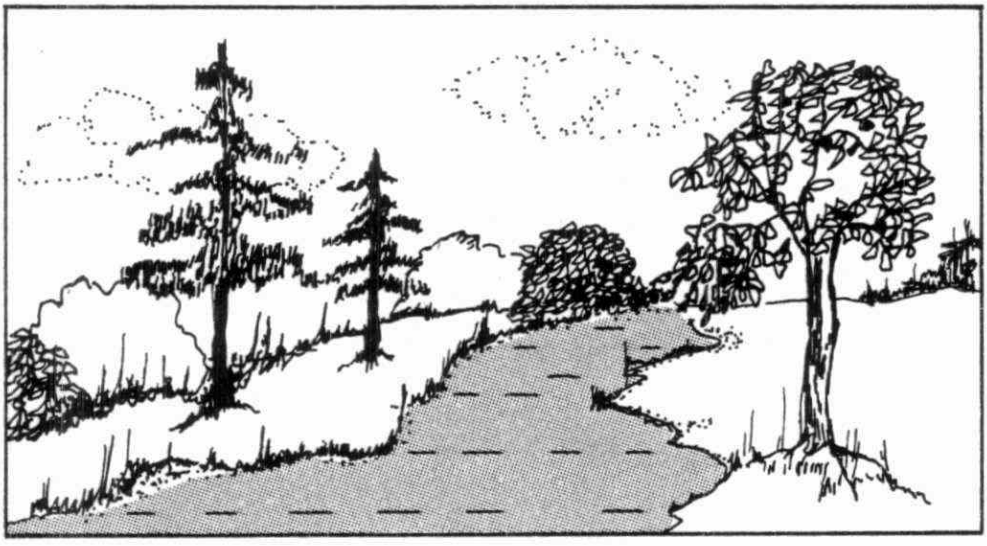

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IN 04 04

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1980 12 12

Ministry of the Environment
Waste Management Branch
135 St. Clair Avenue West
2nd floor
Toronto, Ontario

Attention: Mr. Dennis Tolson

Dear Sir:

Re: Southeastern Region
Industrial Waste Site Identification Study Phase II Part 1

We are pleased to submit our Final Report on our Phase II Part 1 study of the privately owned industrial waste sites of the Southeastern Region.

During the study, we examined 7 sites which were used for waste disposal at various times between the early 1920's and the present.

The report includes an introductory statement which summarizes our study methods and presents our conclusions on the overall study approach and findings. The results of each site investigation are presented in dossier form. This allows each one to be extracted from the master report for circulation to the appropriate companies. Each dossier includes a summary of the field investigation, the results of leachate and gas sampling, a location map, an aerial photograph with overlay, and recommendations which detail follow-up work where required.

.../2

We thank you for the opportunity to conduct these investigations. Should you require further clarification of anything in this Report, please do not hesitate to contact us.

Respectfully submitted,

Water & Earth Science Associates Ltd.

Derek P. Smith, M.Sc., F.G.A.C.

Gore & Storrie Limited

David W. Smith, P.Eng.

SUMMARY REPORT

SUMMARY REPORT

1.0 BACKGROUND

This study is part of a four-phase program developed by the Ministry of the Environment in 1979, to determine the public safety and environmental hazard potential of old waste disposal sites which were in operation prior to 1971. The four phases are as follows:

Phase I	-	Identification of waste disposal sites
Phase II, Part 1	-	Preliminary Investigation of waste disposal sites
Part 2	-	Detailed Investigation of waste disposal sites
Phase III	-	Resolution and rehabilitation of sites where environmental hazards exist
Phase IV	-	Monitoring of specific sites after rehabilitation procedures have been implemented.

This program did not include waste disposal sites operated by industry for their manufactured by-products. Paralleling the Phase II part of the program, the Ministry has initiated, under separate terms of reference, an investigation of these industrial sites. This report presents the findings of the Phase II Part 1 study of the following seven sites in the southeastern region of the Province.

Bakelite Thermosets Ltd. site - Belleville
H. Campbell site - Elizabethtown Township
Courtaulds Ltd. site - Cornwall
Gloucester Sand & Gravel Ltd. site - South Gloucester
H. M. Grant Ltd. site - Gloucester Township
E. MacDougall site - Elizabethtown Township
Metada Ltd. site - South Gloucester

The location of each site is shown on a Provincial map which is included as Figure A of this section of the report.

1.1 STUDY OBJECTIVES AND RESULTS

The primary objective of the Part 1 program was to determine the presence of potential hazards at the old disposal sites which could be detrimental to public safety or the environment. Each site investigation was carried out in sufficient detail to determine whether further studies were required to ascertain the degree of impact. The Part 1 program provides an expert opinion of potential impacts based on a reconnaissance level investigation at each site.

1.2 TERMS OF REFERENCE

The following terms of reference were provided for this study:

The Contractor shall:

1. *Investigate each site in sufficient detail, using indicated paramaters, in order to determine whether further intensive studies should be undertaken to ascertain if a hazard exists to public safety or the environment.*

2. *Sample all surface water streams around the perimeter of the site within 100 metres and test for:*

   (i) chlorides
   (ii) conductivity
   (iii) sulphate
   (iv) alkalinity
   (v) hardness
   (vi) pH
   (vii) TDS/S.S.

   Also any additional parameters that would be indicative of the industrial waste deposited at the site.

   NOTE: Where sufficient data on background levels are not available, additional tests will be done to enable comparisons between up and down stream samples.

3. *Sample all water wells within 100 metres on the landfilling site and test for same parameters as listed in item 2 above. Background levels for the groundwater supply should also be determined.*

In addition water well records should be reviewed and sufficient water level measurements made to estimate the water table elevation together with the direction and rate of flow.

For the situation where no wells are located within 100 metres of the site; the contractor shall provide a plan for locating and drilling test wells for collecting groundwater samples and for determining water table elevations. The plan to be approved by the Steering Committee. The costs associated with this additional work not be included in the contractors bid for the project.

4. *Each site shall be tested for the presence of combustible hydrocarbon gases by the construction of one test well (2" D hole) into the waste on the site. Taking into consideration the particular waste disposed of on the site, other appropriate gases will be analysed for either by field equipment or gas chromatography.*

On sites larger than 1 (one) acre where the first well indicated the presence of gas or the nature of the waste would suggest that gas should be present, one additional test well per acre should be constructed at a reasonable distance and analyzed for gas as indicated above. Buildings on or immediately adjacent to the site should be tested for the presence of hydrocarbons or appropriate gases, where the site wastes so indicate such action is warranted.

6. *Inspect the general area in and around the site to ascertain if there are any leachate springs. Samples of the leachate should be collected and analyzed for the parameters listed in item 2 above. Further, an estimate of the quantity should be made and the point of discharge indicated.*

7. *Inspect the general area in and around the site to ascertain if there is any vegetation that has been affected by leachate or gas migration.*

GENERAL:

The contractor will undertake analysis in the field by using portable field testing (kits) equipment and in addition where necessary collect samples for laboratory analysis of parameters indicative of the types of waste disposed. If any field indicated parameters suggest that the water quality has been affected, the contractor shall collect two (2) litres of water sample and forward it to a laboratory for confirming analysis. M.O.E. laboratory facilities will not be provided for the contractor. The laboratory shall test the sample for any additional parameters that may be used to compare existing water quality to that of background water quality. Parameters shall be selected in direct association with any dangerous waste which has been identified as being disposed of at the site. The occupant of homes using the water for supply shall be asked to describe any taste or odour problems. The local MOH shall be contacted to determine if any unusual health problems exist in the community.

If danger exists or is imminent, the contractor shall notify the Ministry of the Environment immediately on confirmation of test resulte.

The contractor shall identify appropriate studies which are considered necessary to develop abatement measures to remove any danger identified in the field investigation.

2.0 METHODOLOGY

A. BACKGROUND REVIEW

Prior to the field investigations, the following preparatory work was required to maximize our team's effectiveness in the field. This included procuring and tabulating all pertinent data for each site such as:

- relevant Ministry of the Environment and Company data and information;
- topographical maps and aerial photographs at small and large scales;
- information from various sources relative to geographical information, surficial geology, hydrogeology, surface drainage patterns, special terrain features, vegetation and ecological sensitivity.

The background data was supplemented by personal interviews with Company owners, Company engineers and M.O.E. personnel with knowledge of each site.

B. FIELD INVESTIGATIONS

i) Preliminary Reconnaissance

Each site was inspected by our study team of Derek P. Smith (hydrogeologist) and David W. Smith (engineer). The compiled background data concerning the physical characteristics, disposal site operation and environmental impact of each site was verified. Such features as the occurrence of leachate seepage, site geology, vegetational stress areas, the physical water quality, waste types, the disposal operation type and surrounding land uses were noted in particular.

ii) Gas Testing

Test drilling on each site was conducted with a 15 cm power auger and a 1.5 m long hand operated and driven steel probe. A Bacharach Model H Gas-Pointer was used to make combustible gas readings. On one site, Gloucester Sand and Gravel Ltd., gas production observations were made by digging test holes into the buried waste with a backhoe.

Due to the dense nature of fill and waste materials used at 4 sites (H. M. Grant, Bakelite, Metada, Courtaulds) negative gas testing

results are not considered to be completely conclusive. Diamond drill or hollow stem auger holes would be required in each case to check for gas production due to the high clayey, boulder, and cinder block nature of the fill material in each case.

iii) Water and Leachate Testing

Only the Metada Ltd. site has water wells within 100 m of the disposal area. Where it was felt to be important (Gloucester Sand and Gravel and Courtaulds sites) adjacent wells up to 0.5 km from the site were also sampled.

All surface water bodies near or adjacent to sites were sampled. Field analyses were made using Hach chemical and Lamotte chemical portable testing equipment, a Canlab pH meter and a YSI conductivity meter. All samples were analyzed within several hours of being taken. It was our policy to submit any sample for a bulk analysis if even the slightest bit of field evidence pointed to a waste contamination possibility. The following complete analyses were made;

Bakelite site - 3
Campbells site - 1
Courtaulds site - 3
Gloucester Sand and Gravel site - 3
H. M. Grant site - 2
Metada site - 5

After a review of the industrial processes and wastes disposed at each location, the analytical requirements of this study were expanded significantly. Radioactivity, trace element, phenol, nitrogen series and sulphur series elements were included in site specific cases.

iv) Inspection of Homes

Due to the nature of the sites, no homes were investigated for the presence of combustible gas. This was due either to the distance of homes from the site or the type of waste disposed of at each location.

v) Data Analysis and Conclusions

The interview, background, field and analytical data is summarized in this report in a dossier format. All of the information on each site is included in a single section of this document. In other words, each site study could be separated from this report and be reproduced on its own.

Conclusions and recommendations sections are site specific and include a brief summary of our findings, as well as a recommendation for Phase II Part 2 work were required.

3.0 SUMMARY OF FINDINGS

The conclusion and recommendation sections of each report are reproduced below as a summary of the pertinent findings and of the necessity for future work at each site.

BAKELITE THERMOSETS LTD.

Conclusions and Recommendations

There is no field or analytical evidence to indicate that a gas or leachate production is occurring from either of the disposal areas on the Bakelite site. Phenol concentrations in the stream adjacent to the major disposal area can be attributed to process water in the plant drainage system and not the disposal site.

Two holes should be drilled through the waste material at the main disposal area (Site No. 1) if the types of material and leachate production are to be verified. The disposal areas are considered to be a minor environmental problem however, and the necessity to conduct this work should be evaluated after the results of the Dillenback (M.O.E. Kingston) investigation into surface water contamination at the Bakelite Plant are known.

HOWARD CAMPBELL & SONS LTD.

Conclusions and Recommendations

The septic tank sludge disposal operations on the Campbell site are presently being conducted in a concientious and environmentally suitable manner. The remaining effluent in the lagoon should be removed even though analytical evidence shows that a substantial dilution has occurred.

No further work is recommended at the site unless a domestic home utilizing groundwater is to be built near the site or an application for the construction of a lagoon for chemical of sludge waste is received from the owners.

COURTAULDS CANADA LIMITED

Conclusions

Approximately ten years ago, a programme was initiated which included the design of a sub-drain system for collection of leachate and a feasibility investigation of diverting solid wastes from the plant to the municipal landfill site. Although the site no longer receives solid wastes from the plant, the leachate collection system was never installed.

Leachate from the dump site remains a concern to the present time. The analysis of a grab sample of the leachate indicates that it would likely exceed the allowable limits of Cornwall's sewer use by-law for direct discharge to the municipal sanitary sewer system. However, it is considered that the net impact of the loading of the leachate on the sewage treatment plant would not be great, since the flow rates would be very low.

Recommendations

1. A comprehensive drilling programme should be undertaken on the Courtauld's property. It is recommended that a hollow stem auger be employed for the installation of a grid of holes to determine the following:
   i) The lateral extent of the landfill
   ii) The vertical extent of the landfill and characteristics of the cover material and underlying strata

2) Included in the above noted drilling programme, it is also recommended that permanent groundwater sampling stations be installed. Piezometric ground water levels should also be recorded to confirm the direction of groundwater movement.

3) Further sampling and analysis of the leachate should be undertaken to determine the feasibility of discharging the leachate to the municipal sanitary sewer system. This will require discussions with the City of Cornwall regarding maintenance and operation of the sewer system, as well as possible impacts on the sewage treatment plant.

4) Depending on the results of the above noted investigation, further efforts will be necessary to either install a leachate collection system or to confine the leachate on the site.

5) The disposal site and future uses should be permanently identified as follows:

   (a) identify the "limits of fill" on the Official Plan,

   (b) amend the Zoning By-law for the disposal site to restrict future uses,

   (c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

   (d) prohibit future residential development on the disposal site and a limited buffer zone around the site.

GLOUCESTER SAND AND GRAVEL SITE

Conclusions

It can be concluded that a leachate plume is moving in a southerly direction from the site. A variety of waste materials from the demolition of burnt buildings has been buried and piled here since May 1978. The leachate plume is less concentrated, as would be expected, both east and west of the primary flow direction. The leachate plume has already migrated off the Gloucester Sand and Gravel Ltd. property.

Combustible gas is being produced in the waste material and accumulated after the burial with a sand cover.

Homes north and west of the property have not been adversely affected by well contamination or gas problems because of their distance from the site and the southerly direction of groundwater flow.

There is no evidence of ecological damage in areas adjacent to the pit, although the land has been obviously heavily man altered by extraction activities.

Recommendations

Part II Phase 2 work is required. The site should be monitored to determine the following

1) the groundwater flow regime
2) the vertical movement of groundwater in relationship to the Nepean sandstone recharge area
3) the geochemistry of the leachate being produced at the site and
4) the velocity direction and attenuation of leachate movement.

A series of 6 to 8 multilevel piezometer nests would be required to determine the above mentioned information. Two stations should be located north of Site 1 to evaluate the possibility of contaminant migration in this area.

Piezometers should be sampled on a regular basis and gas production should be checked.

The requirement for a leachate treatment plan and future waste disposal activities at the site should be evaluated in light of leachate plume delineation and movement velocity information.

The disposal site and future uses should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-law for the disposal site to restrict future uses,

(c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

(d) prohibit future residential development on the disposal site and a limited buffer zone around this site.

Conclusions and Recommendations

The H. M. Grant disposal area has received a combination of dry construction materials and municipal waste between 1971 and 1976. The site is essentially inactive at present.

The quarry site is heavily man impacted and is devoid of vegetation. A minor gas smell is present at the southern pond in the pit but was the only gas detected at the site. There are no wells near the pit.

There are no leachate springs in the quarry and bulk chemical samples from each of the two ponds showed no evidence of strong leachate production. A 6 ppb phenol reading in the southern pond may be related to some movement of contaminated groundwater into this water body.

Although no evidence of strong leachate production was noted, this can be influenced somewhat by antecedent rainfall and runoff conditions as well as the time lapse from the previous pumping operation. Because of the previous use of the quarry in receiving municipal refuse and the evidence of hydrogen sulphide production, it is recommended that:

(a) additional leachate monitoring and analysis be undertaken to determine more accurately the characterization of this waste and the possible need for treatment. Deeper levels of the pits should be sampled to determine whether thermal or chemical statification of the ponds is occurring. The discharge to McEwen Creek should also be analyzed when the ponds are pumped out the next time,

(b) additional test drilling be undertaken on the site to establish the limits and characterization of the waste and the distribution and type of gas being produced.

The disposal site and future uses should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-law for the disposal site to restrict future uses,

(c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

(d) prohibit future residential development on the disposal site and a limited buffer zone aroung this site.

E. MACDOUGALL LTD.

Conclusions and Recommendations

Liquid industrial wastes were disposed of at the site for an 11 year period. The quantities and type of chemicals dumped at the site are unknown but may include ethylene chloride, toluol, inks and laquer materials.

It is likely that these materials infiltrated the thin sandy surficial materials and entered the bedrock March Formation, which underlies the site. Some evidence exists that 2 of the 4 wells which are adjacent to the site may have been contaminated by effluent movement.

It is recommended that the findings of the Morrison Beatty Report be reviewed in detail before any additional monitoring work is undertaken. In the long term, the possibility of bedrock aquifer contamination should be established and adjacent well waters should be analyzed in a comprehensive manner (i.e. for organic chemicals as well as inorganic elements) on a suitable regular basis.

The disposal site and future uses should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-law for the disposal site to restrict future uses,

(c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses.

(d) prohibit future residential development on the disposal site and a limited buffer zone around this site.

Conclusions and Recommendations

Routine monitoring of a number of wells in the Gloucester Industrial Park is being carried out by the Ottawa Office of the Ministry of the Environment. The molybdenum levels in the Concrete Pipe Ltd. wells should be monitored as part of this program and the human consumption of this water, which is already prohibited, should not be permitted.

There are no serious environmental problems at the site and further work is not recommended.

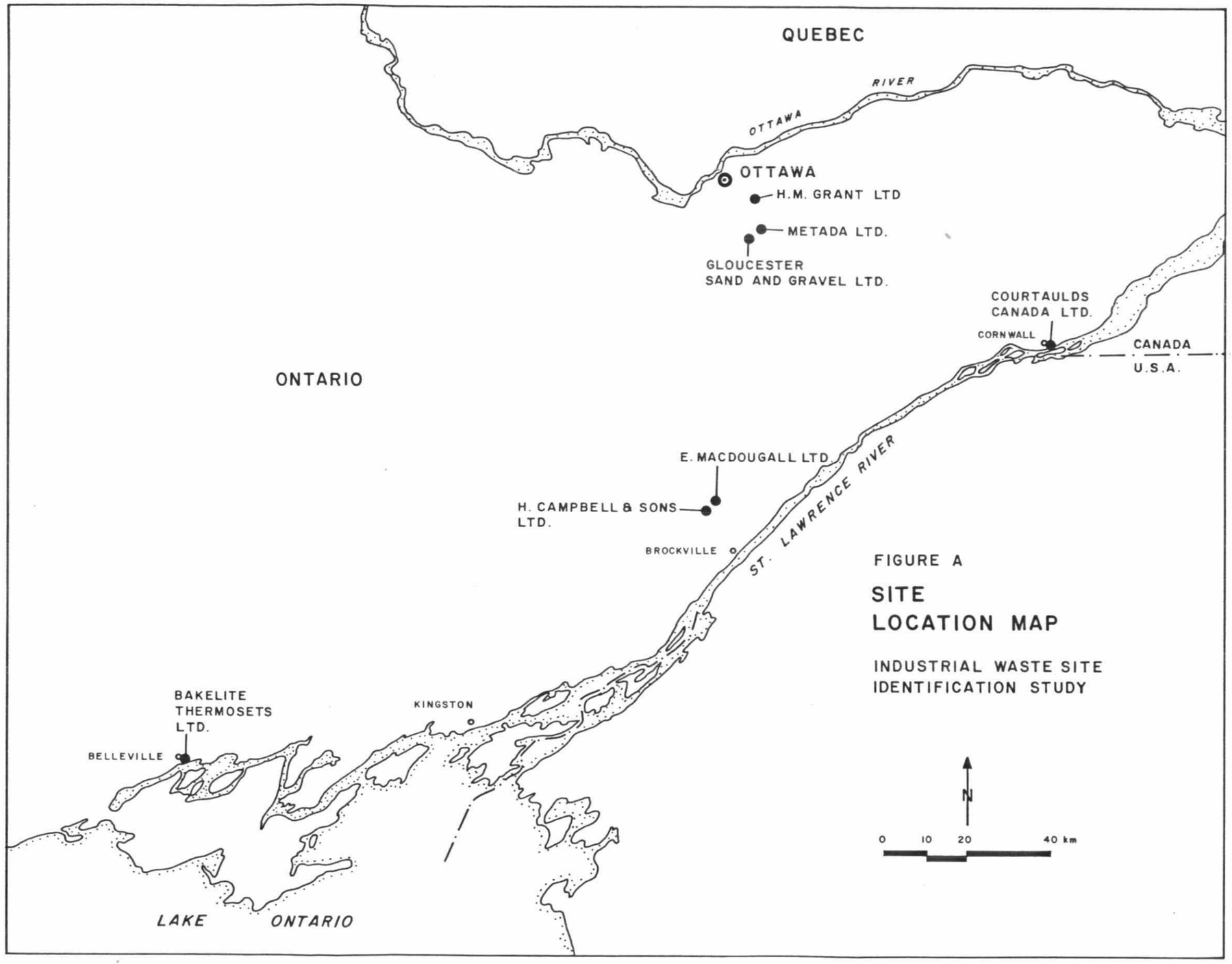


FIGURE A

SITE LOCATION MAP

INDUSTRIAL WASTE SITE
IDENTIFICATION STUDY

MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

BAKELITE THERMOSETS LTD. SITE BELLEVILLE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

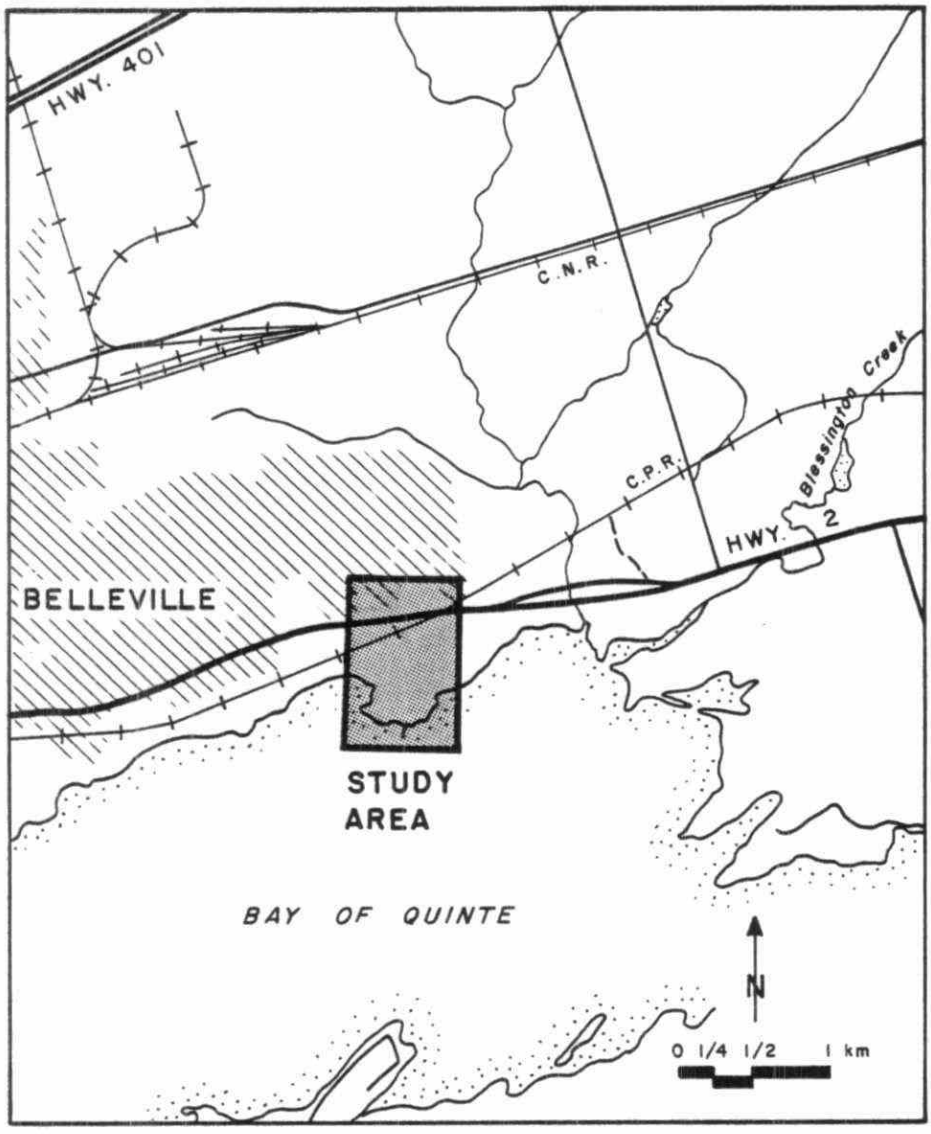


FIGURE 1

LOCATION MAP

BAKELITE THERMOSETS LTD. SITE

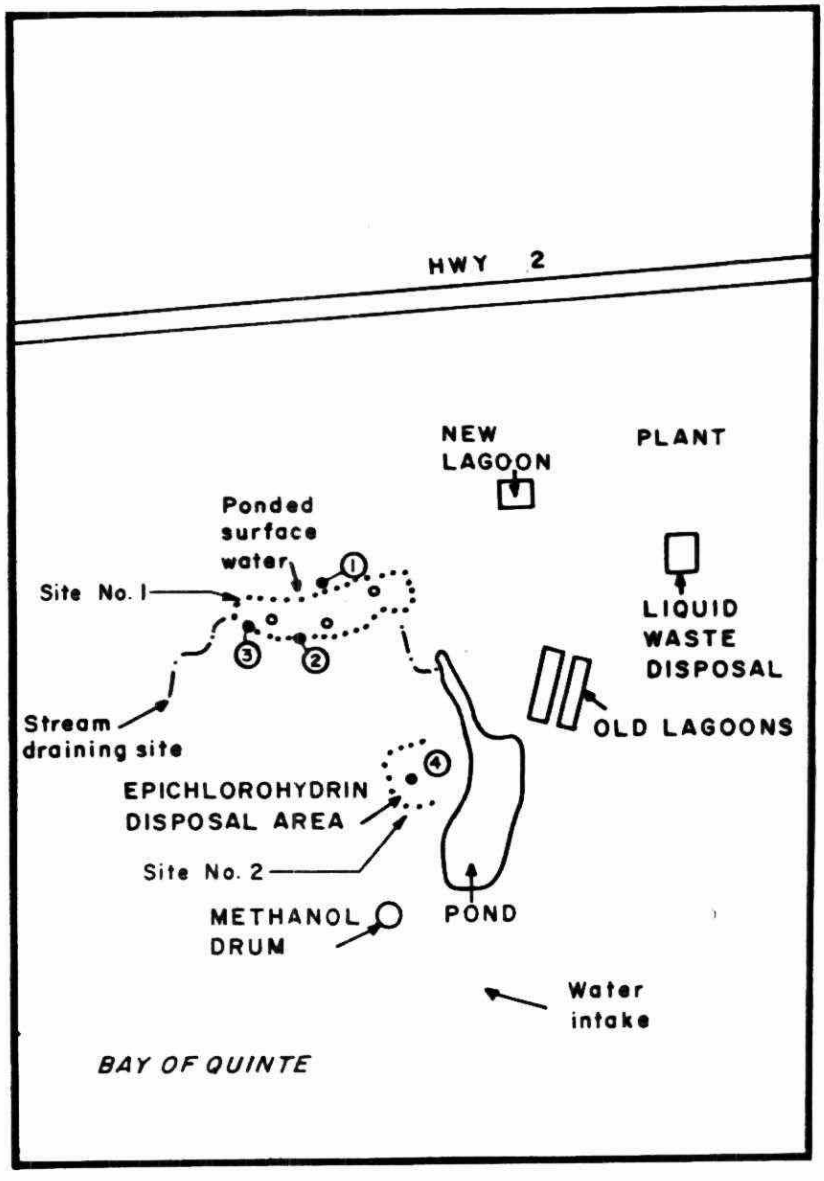


FIGURE 2

LEGEND

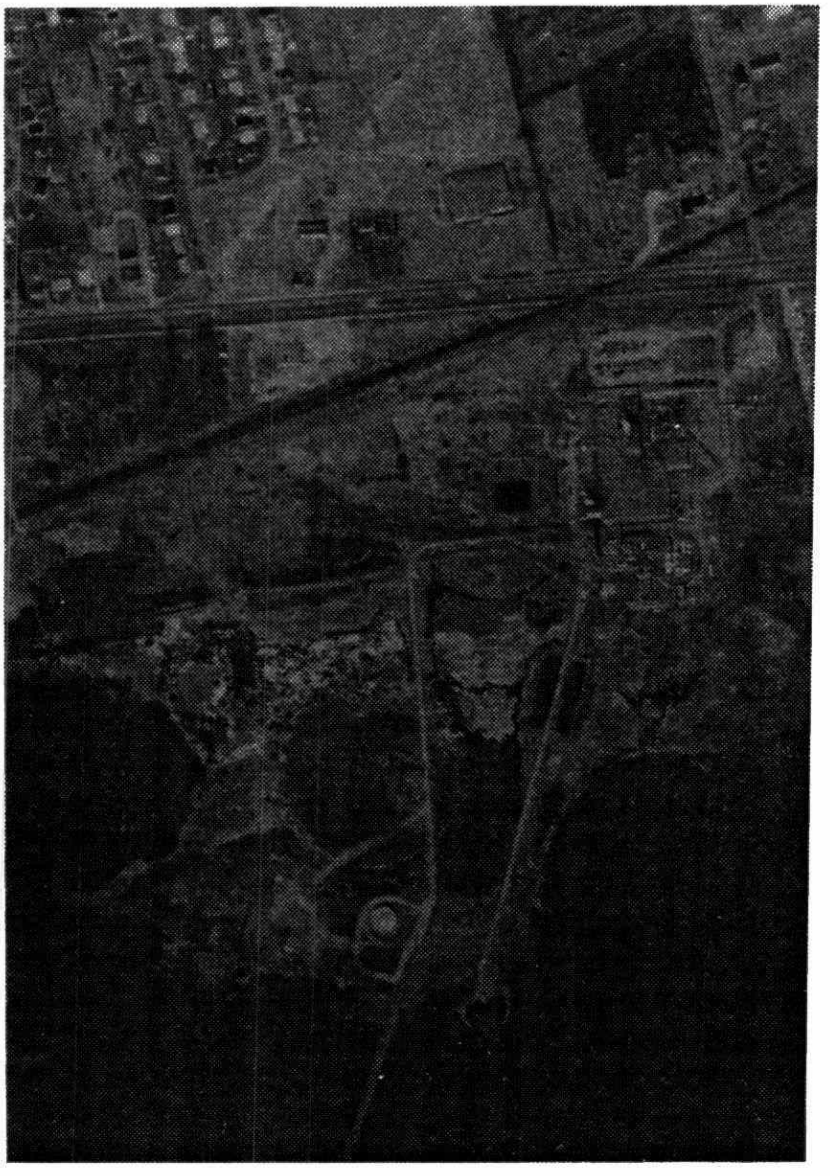
..... LIMIT OF WASTE DISPOSAL AREA

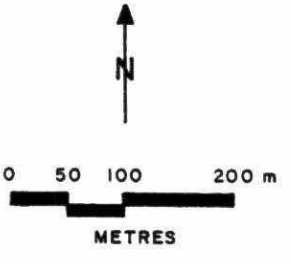
④ WATER SAMPLE LOCATION

o GAS SAMPLING HOLE

Ontario

MINISTRY OF THE ENVIRONMENT





BAKELITE THERMOSETS LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

BAKELITE THERMOSETS LTD. SITE

LOCATION - 521 Dundas Street East, Belleville, Ontario
- South Side of Highway No. 2 at East City Limit (Figure No. 1)

OWNER - Union Carbide of Canada Ltd.

WASTE CHARACTERIZATION

The main finished products produced at the Bakelite Plant include:

- Formaldehyde
- Hexamethylenetetramin
- Solid and Liquid Resins
- Moulding Materials
- Micronized Resins.

Waste products produced during the manufacturing process include the above, as well as various amounts of discarded raw materials. The quantities of these materials which were disposed of at the site are unknown. There are also smaller amounts of miscellaneous plant wastes and construction debris in the disposal site.

SITE HISTORY AND FIELD OBSERVATIONS

There are two areas of waste disposal which were investigated during this study (Figure No. 2).

Site No. 1, which was the main disposal site, is an area of approximately 200 m by 40 m. This site is located in a swampy lowland area along the shoreline of the Bay of Quinte. Site vegetation and topography suggests that the thickness of fill at the site is about 2 metres. This site was actively used from 1950 until 1970, at which time it was closed. The volume of waste disposed at the site is unknown. No historical records concerning amounts of waste, type of waste or waste disposal practices are available. It is reported, however, that portions of the waste disposed were burned prior to burial.

Site No. 2 is an area of approximately 100 to 200 square metres, west of the site roadway north of the methanol storage tank. Reportedly, a number of drums of epichlorhydrin were damaged by a grass fire in this location and therefore, there is a concern that this caused contamination of the immediate area. There are, at present, approximately 20 rotted storage drums visible on surface and in addition, small amounts of black polyethylene pellets which were dumped on surface at this location approximately four years ago.

Solid waste from the plant is no longer deposited at either of these two locations but is hauled to a landfill site. A considerable amount of cooling water and waste process water is discharged on site to ditches in the swampy portions of the site. These streams flow through cattails on the property to the Bay of Quinte. One active lagoon, west of the main plant, receives liquid waste prior to discharge to the sanitary sewer.

The possible contamination by the plant of the Bay of Quinte, was the subject of an extensive sampling and analysis programme undertaken through the Kingston office by Mr. D. Dillenbeck. Results of his investigation will be published by the Kingston office of the Ministry of the Environment in the near future.

South east of the plant, there is a drum storage area which is a fenced compound where full drums of recently produced chemical wastes are stored prior to disposal off the site.

SITE GEOLOGY

Site No. 1 has been formed by fill additions to the marshy shoreline. Recent organic rich lacustrine sediment underlie the site. Site No. 2 is located in a small borrow pit where poorly sorted pebbley sand materials have been removed for construction purposes. This material likely represents a reworked till deposit but is still quite clay/silt rich and impermeable. There are no well log records from the site which permit an interpretation of the stratigraphy of the surficial geology to be interpreted. Bedrock does not outcrop on or adjacent to the Bakelite property.

SITE HYDROGEOLOGY

The location and topography of both sites indicates that all shallow groundwater movement is towards the Bay of Quinte. Leachate production from Site No. 1, if present, would move directly into the stream system which runs adjacent to the southern margin of the disposal mound.

SITE VEGETATION AND ECOLOGICAL SENSITIVITY

Both disposal areas noted above, were covered by grasses. Evidence of rodents, snakes and groundhogs were apparent at both locations. There was no widespread evidence of vegetation kills or leachate springs. At Site No. 1, there was a small area of 2 - 3 square metres having a black oily residue at the surface. This appears to have been caused by a small localized spill. The lack of more substantial vegetation on this site can be attributed to the dense clayey nature of the fill materials at the ground surface.

There is no evidence that recent environmental damage has occurred at either site.

SITE TOPOGRAPHY AND DRAINAGE

All drainage from the Bakelite site is directly to the Bay of Quinte through the ditches and swamps on the property.

There are no wells on or immediately adjacent to the site.

Surface water is ponded at various locations on the property as a result of the landfill operations, road construction and sewer construction on the property.

GAS TESTING

Three hollow stem auger holes were drilled on the site to a depth of greater than 1 m. The presence of methane gases was not detected.

WATER AND LEACHATE TESTING

Four samples were taken on the site from the following locations (Figure No. 2).

1) From an area of ponded surface water immediately north of Site No. 1,

2) From the stream which flows along the southern margin of Site No. 1,

3) From an area of ponded water at the west end of Site No. 1 and

4) From a surface water pond in the middle of Site No. 2.

Field results are included as Appendix A. Due to the possibility of phenol contamination, bulk samples were taken from each locality. Laboratory chemical results are included as Appendix B.

Two anomalous results are indicated, a high phenol level in the stream and a high chloride, T.D.S., hardness and sulphate in Sample No. 1.

Phenol readings in the small stream can be attributed to process water in the ditch system around the plant (Dave Dillenback, M.O.E. Kingston, personal communication). The impermeability of the fill materials at Site No. 1, the lack of leachate springs and the low phenol readings at Location No. 3, indicate that this value is not related to the disposed material.

The chemical results from sampling Location No. 1 cannot be attributed directly to a plant process. These levels are more indicative of a weak leachate production from dry construction wastes (cement, bricks, gypsum, plaster board, etc.).

It should be noted that due to the low permeability of the fill materials, that Sample Nos. 1, 3 and 4 were ponded surface water, diluted by recent precipitation events. Sample No. 2 is from the stream flowing adjacent to disposal Site No. 1. A true idea of the chemistry of leachate production from Site No. 1 would require hollow stem or diamond drilling of several holes to a depth below the water table through the waste.

CONCLUSIONS

There is no field or analytical evidence to indicate that a gas or leachate production is occuring from either of the disposal areas on the Bakelite site. Phenol concentrations in the stream adjacent to the major disposal area can be attributed to process water in the plant drainage system and not the disposal site.

RECOMMENDATIONS

Two holes should be drilled through the waste material at the main disposal site area (Site No. 1) if the types of material and leachate production are to be verified. The disposal areas are considered to be a minor environmental problem however and the necessity to conduct this work should be evaluated after the results of the Dillenback (M.O.E. Kingston) investigation into surface water contamination at the Bakelite Plant is completed.

APPENDIX A

FIELD TESTING RESULTS

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 1
Industrial Site Identification Study

MOE Region Southeastern Region Date Oct.29/80 Company Name Water & Earth Science Associates Ltd. and Gore & Storrie Limited

Site Bakelite Thermosets
(Lot, concession #, or UTM coordinates, name, address)

1 Leachate

ON-SITE TESTS

A. Water bodies within 100 Metres

(bottle 2 lost in transit)

Parameter / Sample Location	1	2	3	4	Results 5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity	233		153	272						
5) Conductivity	700	190	200	300						
6) pH	7.48	7.80	7.69	7.80						
7) Hardness	578		187	306						
8) Sulphates	175		25	20						
9) Temp. (^{0}C)		13								
10)										

B. Wells within 100 Metres

No Wells

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity										
5) Conductivity										
6) pH										
7) Hardness										
8) Sulphates										
9)										
10)										

Lab Tests (2 Litre Samples)

Required, Yes X No _____ If yes, complete Form II, Lab Analysis. If no, go to Part 2, Gas.

2 Gas

C. On-site

Test Holes	CH_4			
#1	nil			
#2	nil			
#3	nil			
#4				
#5				

D. Buildings

Name/Address	CH_4			
1. No buildings				
2.				
3. within 100 m				
4.				
5.				

3 General Coments (vegetation, leachate springs, depth, odours, etc.) (see text)

(Detail all test point locations in a sketch on reverse side)

Form completed by D. P. Smith

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APPENDIX B

RESULTS OF LABORATORY ANALYSIS

TABLE NO. 1

BULK SAMPLE RESULTS

BAKELITE THERMOSETS LTD., BELLEVILLE, ONTARIO

	TDS mg/l	Alk as $CaCo_3$	Total Hardness as $CaCo_3$	Ammonia N	SO_4	Phenol ug/ℓ	Cl	Fe
1.	726	209	390	2.91	127	<5	119	.07
2.	158	98	114	1.74	15.5	187	8	1.8
3.	175	111	118	0.43	10.7	<5	8	.21
4.	287	216	244	1.79	12.2	<5	1	.14

(in mg/l unless otherwise noted)

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 2
Industrial Site Identification Study

MOE Region Southeastern Date Oct.29/80 Company Name Water & Earth Sciences Associates Ltd. and Gore & Storrie Limited

Site Bakelite Thermosets Limited
(Lot, concession#, or UTM coordinates, name, address)

A. Water bodies within 100 Metres
(2 litre samples)

Parameter	Results									
	1	2	3	4	5	6	7	8	9	10
1) Chlorides	119	8	8	1						
2) TDS	726	158	175	287						
3) Suspended Solids										
4) Alkalinity	209	98	111	216						
5) Conductivity										
6) pH										
7) Hardness	390	114	118	244						
8) Sulphates	127	15.5	10.7	12.2						
9) Ammonia, N	2.91	1.74	0.43	1.79						
10) Iron	.07	1.8	.21	.14						
11) phenol, ug/ℓ	<5	187	<5	<5						
12)										
13)										
14)										
15)										
16)										
17)										
18)										

B. Wells within 100 Metres
(2litre samples)

Parameter	Result									
	1	2	3	4	5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity										
5) Conductivity										
6) pH										
7) Hardness										
8) Sulphates										
9)										
10)										
11)										
12)										
13)										
14)										
15)										
16)										
17)										
18)										

Analyst V. Matys

Name of Laboratory Gore & Storrie Limited

Any significant odour problems? Yes _____ No X

Recommend abatement or pertinent studies

See text

(Detail all test point locations in a sketch on reverse side)

Form completed by David W. Smith

1667

MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

H. CAMPBELL & SONS LTD. SITE ELIZABETHTOWN TWP.

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

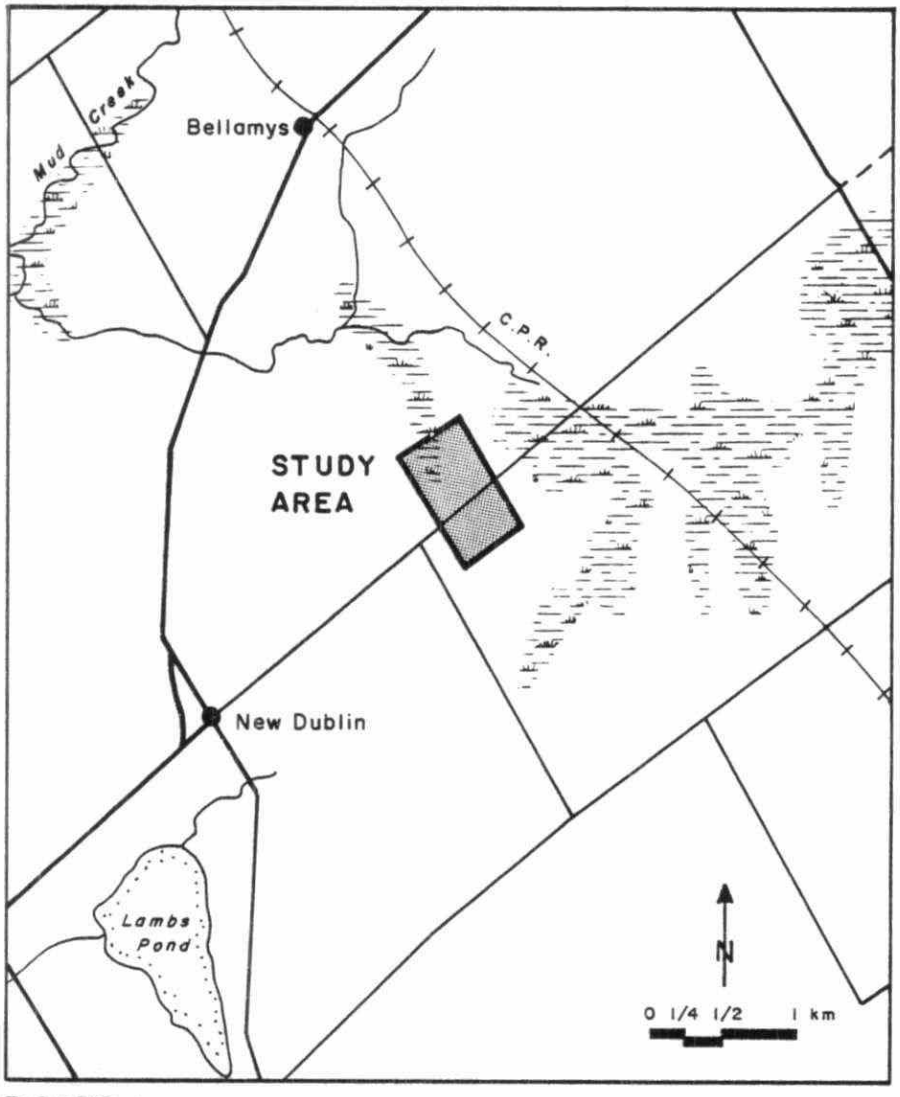


FIGURE 1

LOCATION MAP

H. CAMPBELL & SONS LTD. SITE

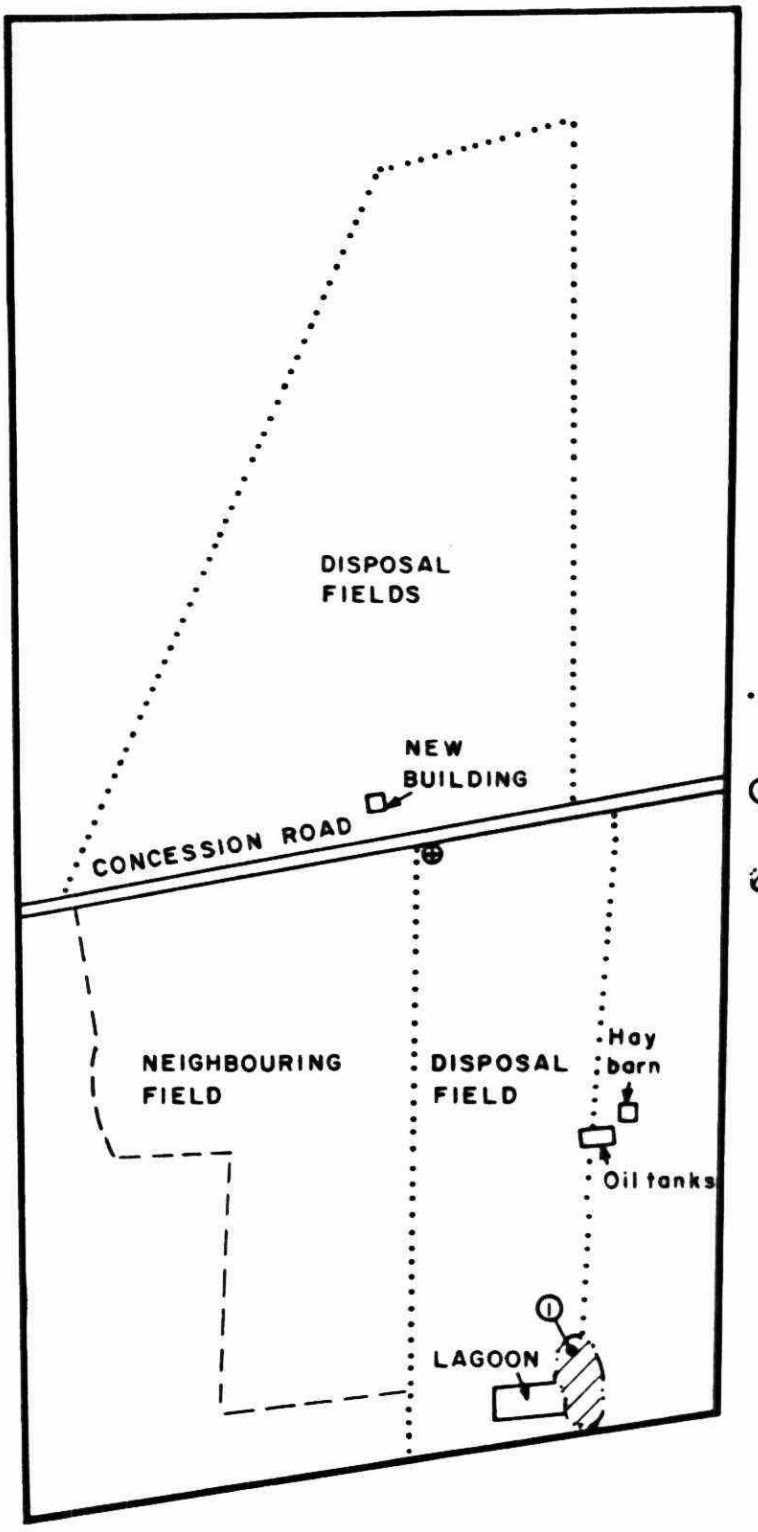


FIGURE 2

LEGEND

LIMIT OF DISPOSAL AREA FOR SEPTIC TANK EFFLUENT

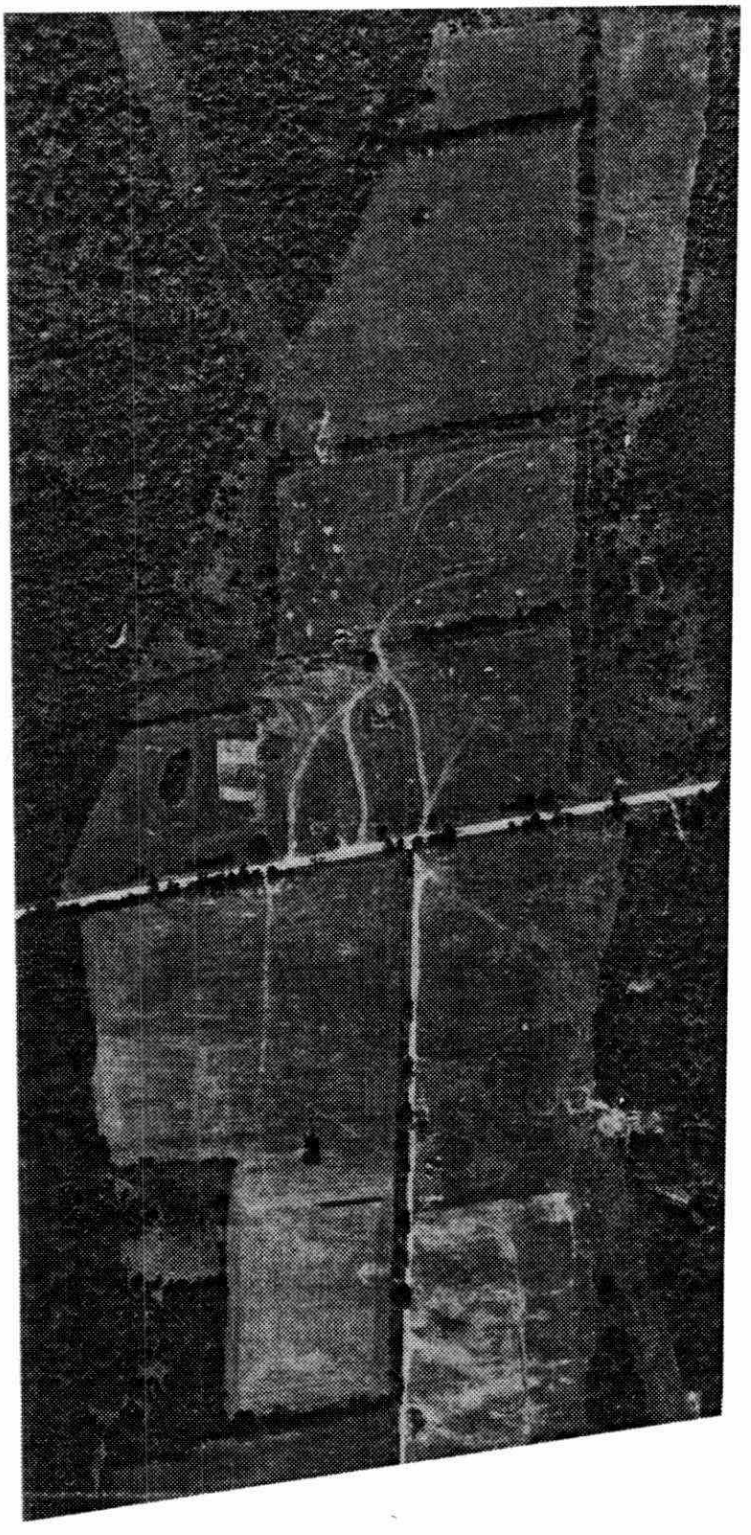
WATER SAMPLE LOCATION

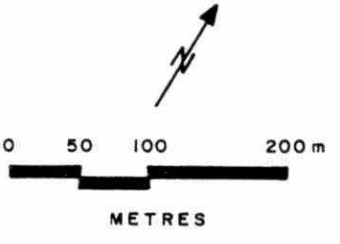
AREA OF VEGETATION KILL

SHALLOW WELL

MINISTRY OF THE ENVIRONMENT

Ontario





H. CAMPBELL & SONS LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

HOWARD CAMPBELL AND SONS SITE

LOCATION - The site is approximately 11 kilometers north of Brockville, Ontario, (Figure No. 1) and slightly northeast of the hamlet of New Dublin. The closest domestic residence to the property is located in an uphill direction, about 1 km to the southwest.

OWNER - Earl Campbell, Lynn, Ontario.

SITE HISTORY

The site was opened in 1963 and is still active. At present, the site is licensed for the surface disposal of septic tank effluent and is not being used for other purposes.

In the summer of 1977, Mr. Campbell built a logoon on the site (Figure No. 2) for the winter retention of sewage on the orders of the Ministry of the Environment in Kingston. The lagoon was empty during our field investigation.

In the spring of 1979, the east wall of the lagoon berm broke and considerable damage to the vegetation occurred as a result of the spill. The field observations by staff of the Ministry of the Environment indicated that the lagoon was leaking and contaminating the nearby surface flow regime during the summer of 1979. The owners were asked to pump the lagoon out and stop this type of disposal operation at this time.

During the summer of 1979 or early spring 1980, some digested sludge from the Whitehouse Motel in Brockville was disposed of on the site. This was apparently ploughed into fields. A letter from M.O.E. Kingston, dated May 30, 1980, discouraged this practice and it was apparently discontinued at that time.

FIELD OBSERVATIONS AND WASTE CHARACTERIZATION

The fields north of the Concession Road have been used for the surface disposal of two types of effluent, septic tank effluent and an egg production waste from Burn Brae Farms. The egg waste is a white organic and protein rich effluent,

which contains shells and faecal material. It is ploughed into the fields after spreading and only a slight odour and patches of white crust on the soil surface are evident in the field.

South of the Concession Road the fields have been used for the disposal of septic effluent. A 1 metre deep lagoon (Figure No. 2) was constructed with sandy berm walls and received

1) Waste from the Genstar Fertilizer Co. operation. This included ammonia, ammonium nitrate and urea in high concentrations.
2) A few barrels of industrial acid of unknown type.
3) Some bunker oil from a Genstar spill and the straw and fibrous matting used in the cleanup operation.

On the east side of the site, 4 large tanks are used for the storage of waste oil used for the control of dust on County Roads in summer. A small berm has been constructed around this area and oil spillage is restricted to the area within this berm.

The owners are growing hay on several of their fields and are rotating their disposal areas frequently. The operation appears to be very well managed at the present time.

BEDROCK GEOLOGY

The Campbell site is underlain by the lower strata of the Oxford Formation, a black, thinly stratified shaley dolomite and the March Formation, a dolomite and white sandstone transitional unit. A northeast to southwest contact between these formations approximately bisects the property. Both these rock units are typically fractured and have dissolution features along bedding planes. The March Formation outcrops widely throughout this region.

SURFICIAL GEOLOGY

A blanket of medium grained, fine silty sand and sandy glacial till overlies bedrock on the Campbell site. Although rock is not exposed on the surface, surficial materials appear to be thin across the site, judging from local, apparently rock controlled microrelief. It is expected that a maximum surficial thickness of 3 - 5 m is present on the property.

Henderson (Geological Survey Map 6-1970) describes the surficial geology as being thin sandy till over bedrock with swamp and bog deposits in lowlands. The sandy appearance of the upper soil surface is associated with aeolian reworking of the till material.

SITE HYDROGEOLOGY

A hydrogeological investigation has not been conducted at the site. It is likely that the watertable in the unconfined surficial materials is within a metre of the ground surface. Some vertical movement of effluent into the fractured bedrock is likely occurring with local discharge to the swampy lowland areas which occur adjacent to the site.

SITE TOPOGRAPHY

The site is located on a broad ridge and is well drained. Local small variation in relief occur across the site. Swampy lowland areas make up the eastern border and the northeastern corner of the Campbell property.

SITE VEGETATION AND ECOLOGICAL DAMAGE

The Campbell operation is located on a series of farmers' fields which are delineated by hedgerows of mature deciduous forest. Heavy forest surrounds the cleared area on all sides (Figure No. 2). The area of trees and vegetation that were killed by the 1979 spill is indicated on Figure No. 2. This is the only area of ecological damage noticed on the site.

GAS TESTING

Due to the nature of the disposal operation gas testing was not conducted on the site. There are no homes within 1 km of the property.

LEACHATE TESTING AND PREVIOUS CHEMICAL INVESTIGATIONS

Two samples of the effluent in the lagoon were analyzed by Genstar Ltd.

	March 1979	October 1979
Ammonia	.15%	.02%
Ammonium Nitrate	12.85%	.85%
Urea	2.15%	Nil
Total Nitrogen	5.63%	.32%

A considerable concentration decrease is evident because much of the effluent was pumped out and removed off site in early spring 1979.

A bulk sample of the surface water, which is ponded at the east end of the lagoon, was taken for analysis. Results are as follows (in mg/ℓ unless indicated.

Ph (units)	7.6
Chloride	111
Suspended Solids	12.0
Total Dissolved Solids	2180
Phenol (PPb)	<5
Hardness ($CaCo_3$)	1105
Alkalinity	290
5 Day B.O.D.	15
C.O.D.	76
Total Kjeldahl Nitrogen	1.06
Nitrate	10.23
Urea	Not done due to low concentration.

Results indicate that only low levels of nitrogen elements remain in this effluent. It is the intention of the owner to remove the remaining surface water from this area when field conditions are favourable.

The shallow well (located on Figure No. 2) which is used to supply water to wash the trucks could not be sampled. A small animal had drowned in the well recently and had contaminated the water supply.

CONCLUSIONS

The septic effluent disposal operations on the Campbell site are presently being conducted in a concientious and environmentally suitable manner. The remaining effluent in the lagoon should be removed even though analytical evidence shows that a substantial dilution has occurred.

RECOMMENDATIONS

No further work is recommended at the site unless a domestic home, utilizing groundwater, is to be built near the site or an application for the construction of a lagoon for chemical or sludge waste is received from the owners.

The disposal site and future uses should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-Law for the disposal site to restrict future uses,

(c) register a notice on the title of the property with the Land Registrar, which identifies the disposal site, the potential impacts and the restricted future uses,

(d) prohibit future residential development on the disposal site and a limited buffer zone around this site.

APPENDIX A

RESULTS OF LABORATORY ANALYSIS

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 2
Industrial Site Identification Study

MOE Region Southeastern Date Nov. 5/80 Company Name Water & Earth Science Associates Limited and Gore & Storrie Limited

Site H. Campbell & Sons Ltd. Site
(Lot, concession#, or UTM coordinates, name, address)

A. Water bodies within 100 Metres
(2 litre samples)

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides	111									
2) TDS	2180									
3) Suspended Solids	12									
4) Alkalinity	290									
5) Conductivity										
6) pH	7.6									
7) Hardness	1105									
8) Sulphates										
9) Phenol p.p.b.	<5									
10) BOD_5	15									
11) COD	76									
12) TKN	1.06									
13) Nitrate	10.23									
14)										
15)										
16)										
17)										
18)										

B. Wells within 100 Metres
(2litre samples)

Parameter	Result 1	2	3	4	5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity										
5) Conductivity										
6) pH										
7) Hardness										
8) Sulphates										
9)										
10)										
11)										
12)										
13)										
14)										
15)										
16)										
17)										
18)										

Analyst V. Matys

Name of Laboratory Gore & Storrie Limited

Any significant odour problems? Yes _____ No X

Recommend abatement or pertinent studies

See text

(Detail all test point locations in a sketch on reverse side)

Form completed by D.W. Smith

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MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

COURTAULDS CANADA LTD. SITE CORNWALL

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

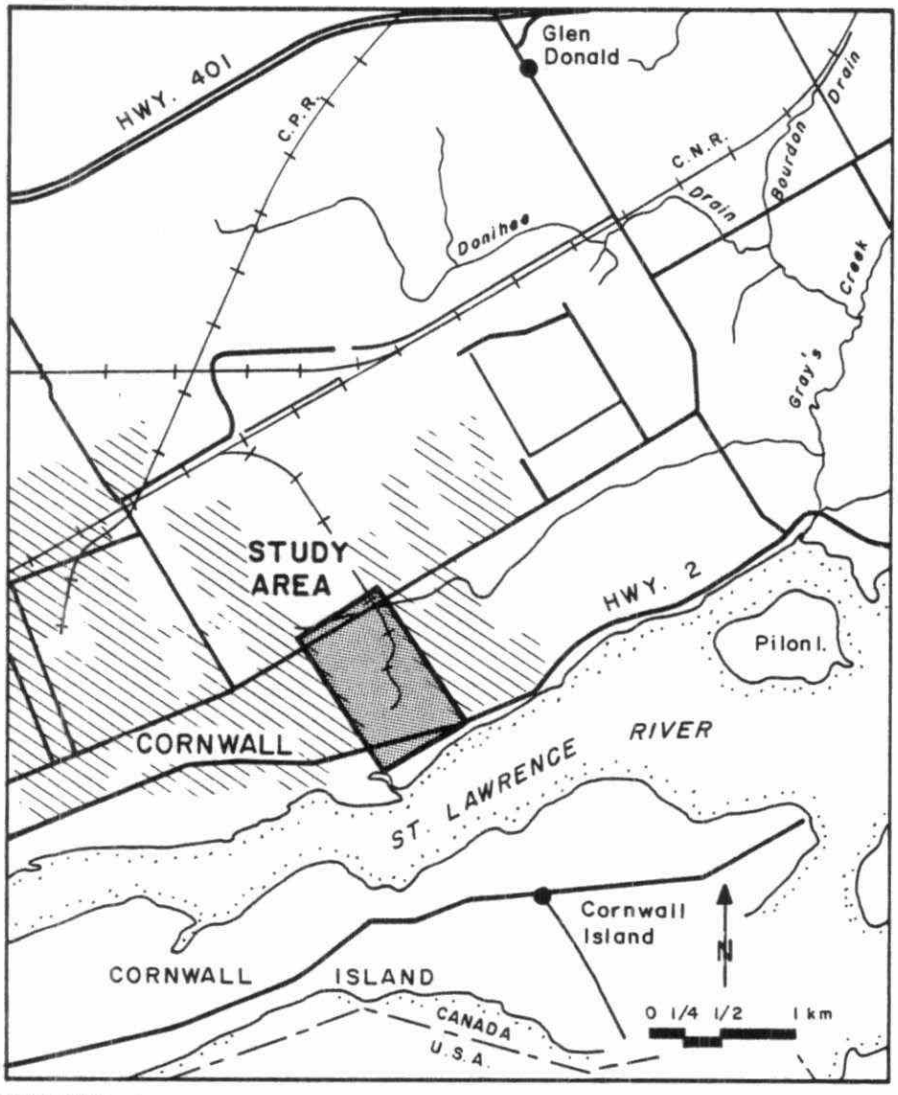


FIGURE 1

LOCATION MAP

COURTAULDS CANADA LTD. SITE

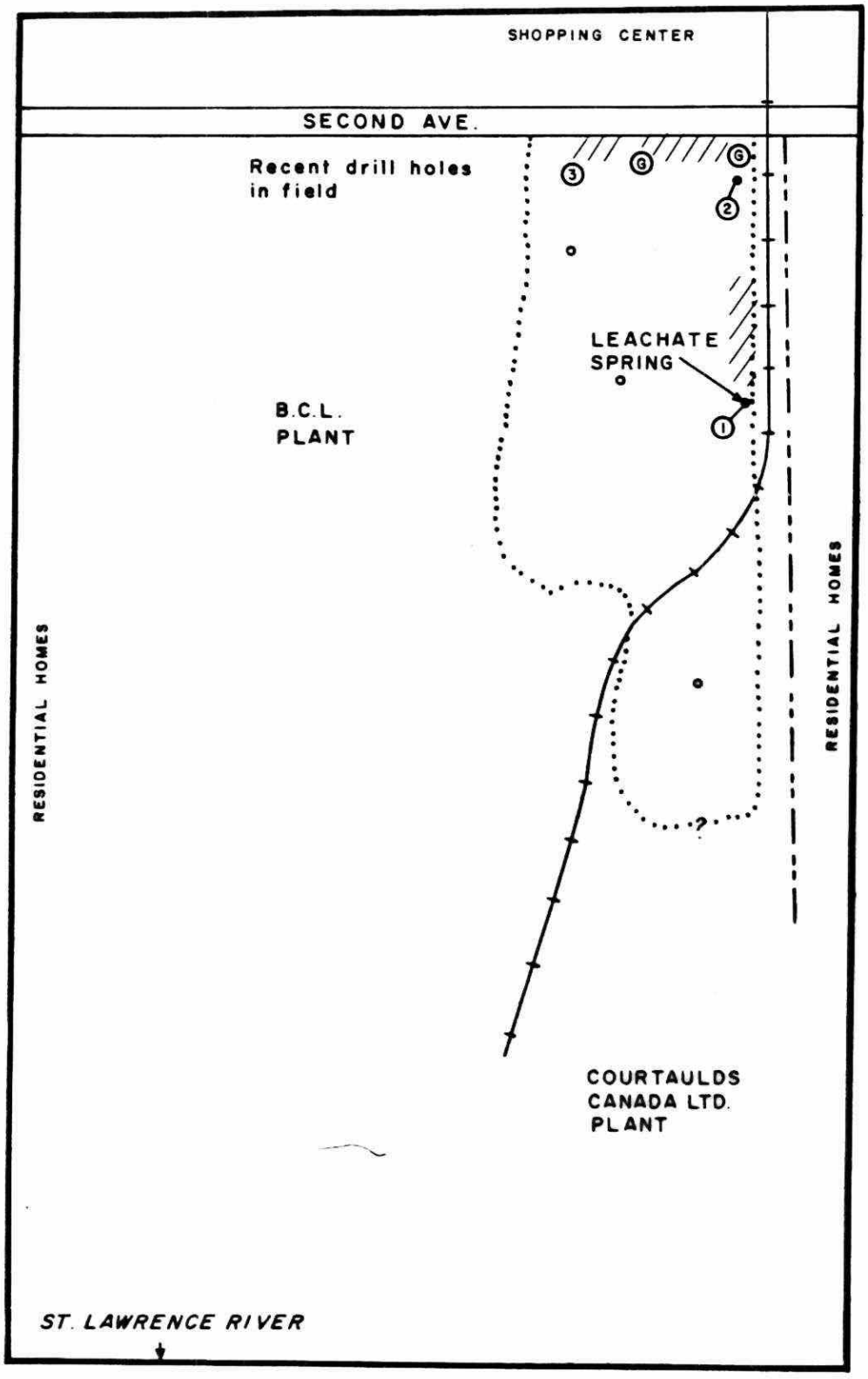


FIGURE 2

LEGEND

APPROXIMATE LIMIT OF WASTE DISPOSAL AREA

MANHOLE WITH GAS READINGS

AREA OF PONDED WATER IN DITCH

GAS SAMPLING HOLE

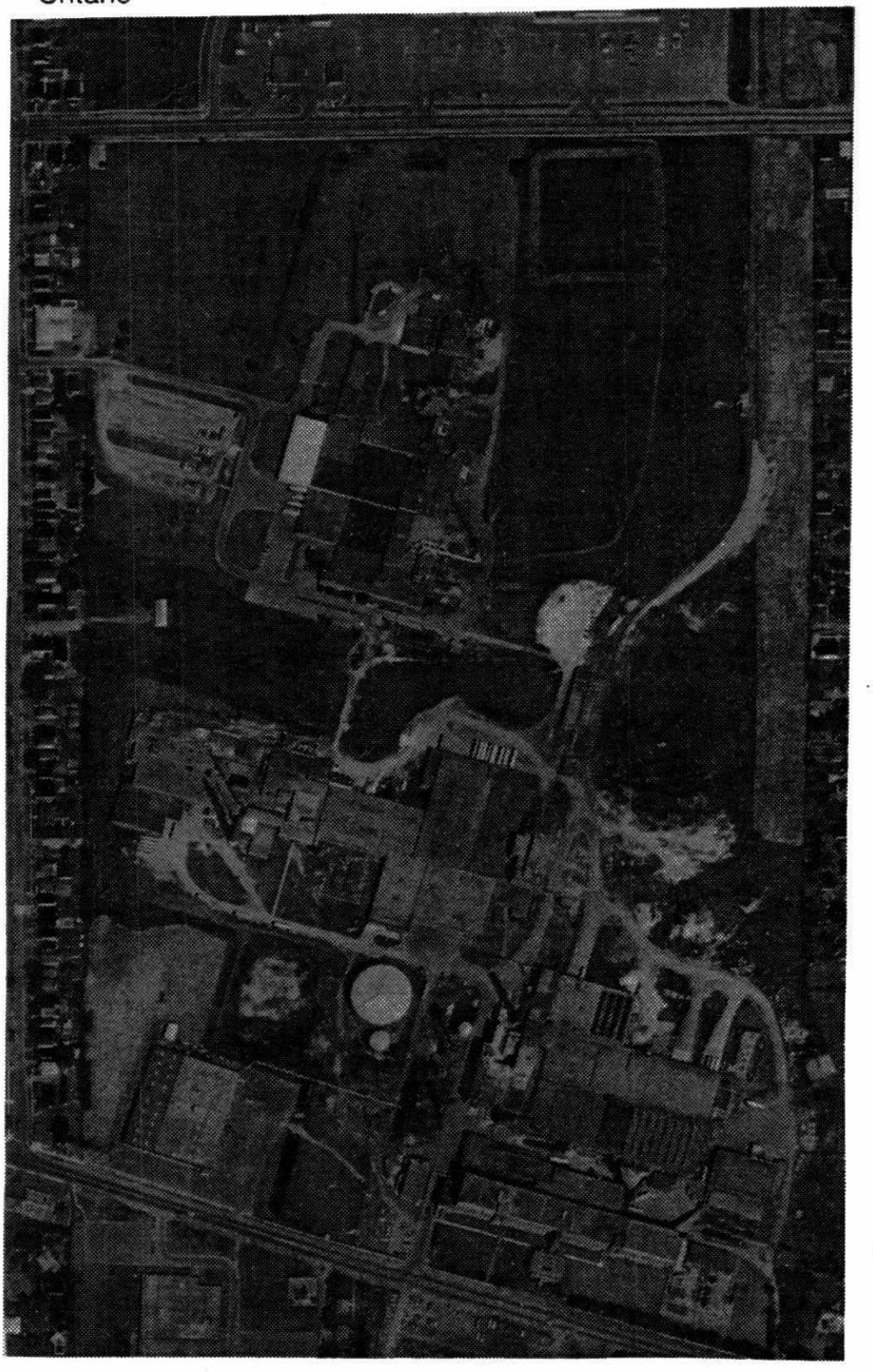
COLLECTOR SEWER

RAILWAY SPUR LINE

WATER SAMPLE LOCATION

MINISTRY OF THE ENVIRONMENT

Ontario



0 25 50 100 m

METRES

COURTAULDS CANADA LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

COURTAULDS (CANADA) LIMITED

VISCOSE DUMP SITE, CORNWALL, ONTARIO

LOCATION - This landfill site is located at the northeast of the plant property, which is located between Second Street and Montreal Road on the east side of Cornwall (Figure No. 1).

OWNER - Courtaulds (Canada) Limited

SITE HISTORY AND WASTE CHARACTERIZATION

From previous correspondence with M.O.E., the major portion of the plant waste, which was disposed at this site, consists of viscose filter cloths. These filter cloths amount to approximately 2 270 kg per week, made up of 12% cellulose, 6% NaOH, 2% S and 80% water.

From the time the site began operating in the 1920's, it received almost all solid waste material generated at the plant which, in addition to the filter cloths, also included waste fibre, building rubble, baling wire and other miscellaneous scrap.

SITE GEOLOGY

The Courtaulds site is located on an upland drumlinized exposure of the Fort Covington till. This material is pebbley with a silty sand matrix and can be moderately permeable where reworked by wave action associated with either the Champlain Sea (which retreated from the Cornwall area about 10,000 years ago) or recent high water phases of the St. Lawrence River. The till unit is usually greater than 10 m thick in this area.

The region is underlain by bedrock of the Ottawa Formation, which yields very hard, iron rich and often high sulphate water. The latter quality is related to gypsum deposits which are found throughout the Cornwall-Charlottenburgh area in the near surface bedrock.

There are no bedrock outcrops throughout the Courtaulds Plant area.

SITE HYDROGEOLOGY

One water well is located on the Courtaulds property. This is used to provide cooling water for the BCL Plant. A bulk sample of this water was analyzed and revealed high B.O.D. and sulphate concentrations, indicating that some low level contamination of this water supply has occurred. It is unlikely that the well is cement grouted.

Local surface water flow at the disposal site will occur in a radial pattern, controlled by topographic gradients (ie., gravity) and the configuration of the contact between the waste material and the Fort Covington till.

The leachate spring at the northeastern corner of the site suggests that the till may be of a lower hydraulic conductivity than the waste material and the lateral migration of leachate is occurring as a consequence.

SITE VEGETATION

The site is covered by grasses with some small trees and brush located along the property boundaries. There is no vegetation in a small area at the leachate spring on the northeast portion of the site.

SITE TOPOGRAPHY AND DRAINAGE

From M.O.E. records, it is noted that Courtaulds originally located the landfill site on a height of land. It is estimated that there is now a 15 m - 18 m slope from the top of the landfill site to the north limit of the property. Surface

drainage from the landfill area is radially outward. No ponding of the surface water was observed on the site.

ECOLOGICAL SENSITIVITY

As shown on Figure No. 2, the site is bounded by residential and commercial development. At the time of our field investigation, it was noted that a strip of the property along Second Street is currently being investigated for possible sale for commercial development.

Therefore, despite the fact that leachate from the site does not directly threaten drinking water supplies from wells, the potential impacts of gas migration runoff from the site contaminated by leachate and movements of a leachate plume are considered to be very significant.

GAS TESTING

Methane testing was carried out at three locations (figure No. 2) near the landfill site in holes approximately 1 metre deep. No trace of methane was noted, but it is felt that this can be attributed to the impervious nature of the cover material.

Traces of methane were measured at the sewer manholes along the north side of the property. A very heavy hydrogen sulphide odour was also noticed in this vicinity.

Previous investigations of odour problems in the adjacent neighbourhoods and sewer systems have been undertaken by the M.O.E. One report, dated February 15, 1977, attributes these odours, in part, to the sulphate rich sewage and infiltration from the Courtaulds site.

WATER AND LEACHATE TESTING

Water samples were collected from the well on the property in addition to the three locations shown on Figure No. 2.

Details of the well construction are unknown. Therefore, it is not known whether the contamination of the well, indicated by the analytical results, was caused by surface inflow into a poorly constructed well or by a contaminated aquifer.

Water sample No. 1, indicates a highly contaminated leachate, typical of other previous analyses of leachate at this site. Samples 2 and 3 are surface water samples which indicate contamination by the leachate spring.

Analytical results of these four samples are included as Appendix A of this section of the report.

CONCLUSIONS

Approximately ten years ago, a programme was initiated which included the design of a sub-drain system for collection of leachate and a feasibility investigation of diverting solid wastes from the plant to the municipal landfill site. Although the site no longer receives solid wastes from the plant, the leachate collection system was never installed.

Leachate from the dump site remains a concern to the present time. A prominent leachate spring on the northeast portion of the site is clearly visible on the attached aerial photograph. The analysis of a grab sample of this leachate indicates that it would likely exceed the allowable limits of Cornwall's sewer use by-law for direct discharge to the municipal sanitary sewer system. However, it is considered that the net impact of the loading of the leachate on the sewage treatment plant would not be great, since the flow rates would be very low.

RECOMMENDATIONS

1. A comprehensive drilling programme should be undertaken on the Courtauld's property. It is recommended that a hollow stem auger be employed for the installation of a grid of holes to determine the following:
   (i) The lateral extent of the landfill
   (ii) The vertical extent of the landfill and characteristics of the cover material and underlying strata.

2. Included in the above noted drilling programme, it is also recommended that permanent groundwater sampling and gas monitoring stations be installed. Piezometric groundwater levels should also be recorded to confirm the direction of groundwater movement.

3. Further sampling and analysis of the leachate should be undertaken to determine the feasibility of discharging the leachate to the municipal sanitary sewer system. This will require discussions with the City of Cornwall regarding maintenance and operation of the sewer system, as well as possible impacts on the sewage treatment plant.

4. Depending on the results of the above noted investigation, further efforts will be necessary to either install a leachate collection system or to confine the leachate on the site.

5. The disposal site and future uses should be permanently identified as follows:

   (a) identify the "limits of fill" on the Official Plan,

   (b) amend the Zoning By-law for the disposal site to restrict future uses,

   (c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

   (d) prohibit future residential development of the disposal site and a limited buffer zone around this site.

APPENDIX A

WATER SAMPLE RESULTS

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 2
Industrial Site Identification Study

MOE Region: Southeastern Date: Nov./80 Company Name: Water & Earth Science Associates Limited and Gore & Storrie Limited

Site: Courtaulds Canada Ltd.
(Lot, concession#, or UTM coordinates, name, address)

A. Water bodies within 100 Metres
(2 litre samples)

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides	4.5	3.0	100							
2) TDS	10890	1995	1500							
3) Suspended Solids	290	23	11							
4) Alkalinity	6350	675	455							
5) Conductivity	6000	1100	1250							
6) pH	8.1	8.1	7.8							
7) Hardness	660	345	530							
8) Sulphates	2213	804	652							
9) Sulphite	12	N.D.	3							
10) BOD_5	1500	12	5							
11) COD	3437	28	12							
12) Na	740	201	320							
13) Fe	1.58	0.19	.07							
14) Zn	.463	.015	.023							
15) Phenols	455	<5	<5							
16)										
17)										
18)										

B. Wells within 100 Metres
(2litre samples)

Parameter	Result 1	2	3	4	5	6	7	8	9	10
1) Chlorides	131									
2) TDS	2185									
3) Suspended Solids	3									
4) Alkalinity	155									
5) Conductivity										
6) pH	6.7									
7) Hardness	1330									
8) Sulphates	1126									
9) Sulphite	3.0									
10) BOD_5	4.0									
11) COD	4.0									
12) Na	510									
13) Fe	0.12									
14) Zn	.018									
15) Phenol mg/ℓ	<5									
16)										
17)										
18)										

Analyst: V. Matys

Name of Laboratory: Gore & Storrie Limited

Any significant odour problems? Yes X No ____

Recommend abatement or pertinent studies

See Text

(Detail all test point locations in a sketch on reverse side)

Form completed by: D. W. Smith

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MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

GLOUCESTER SAND AND GRAVEL LTD. SITE GLOUCESTER TWP.

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

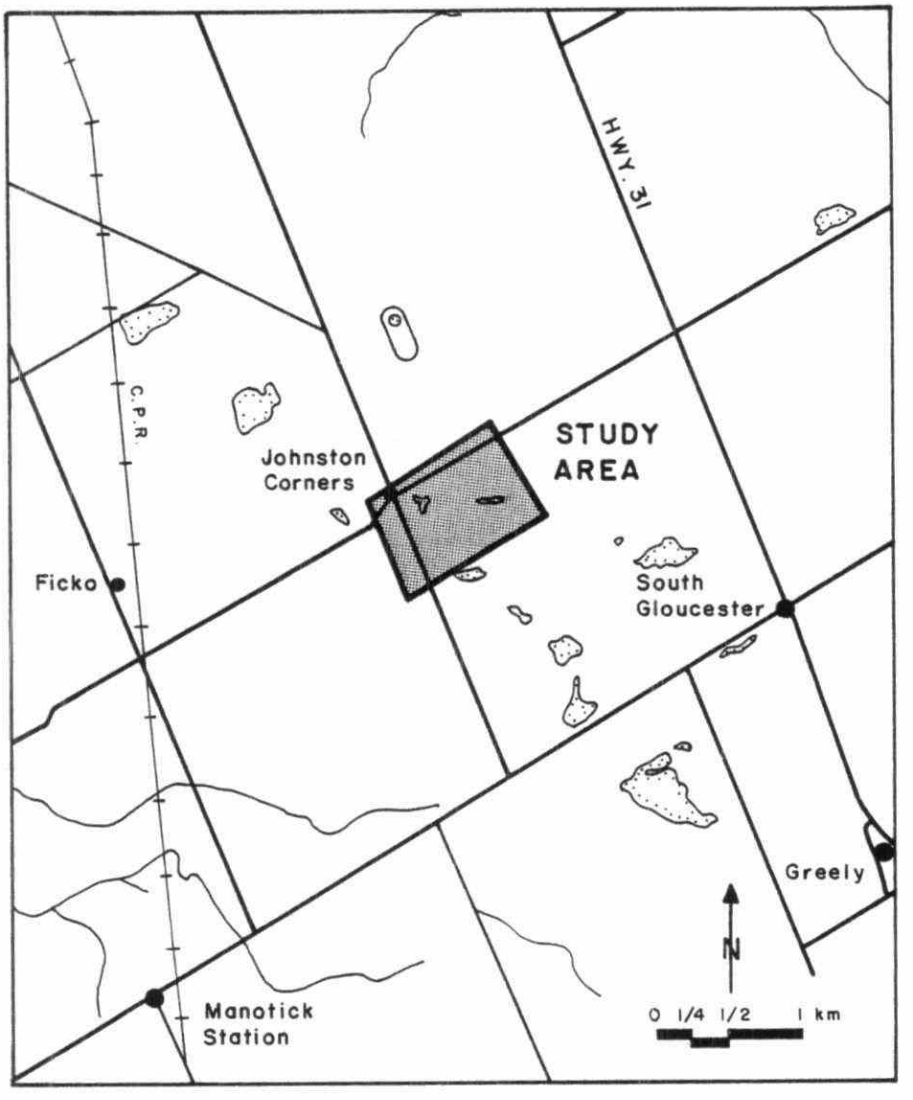
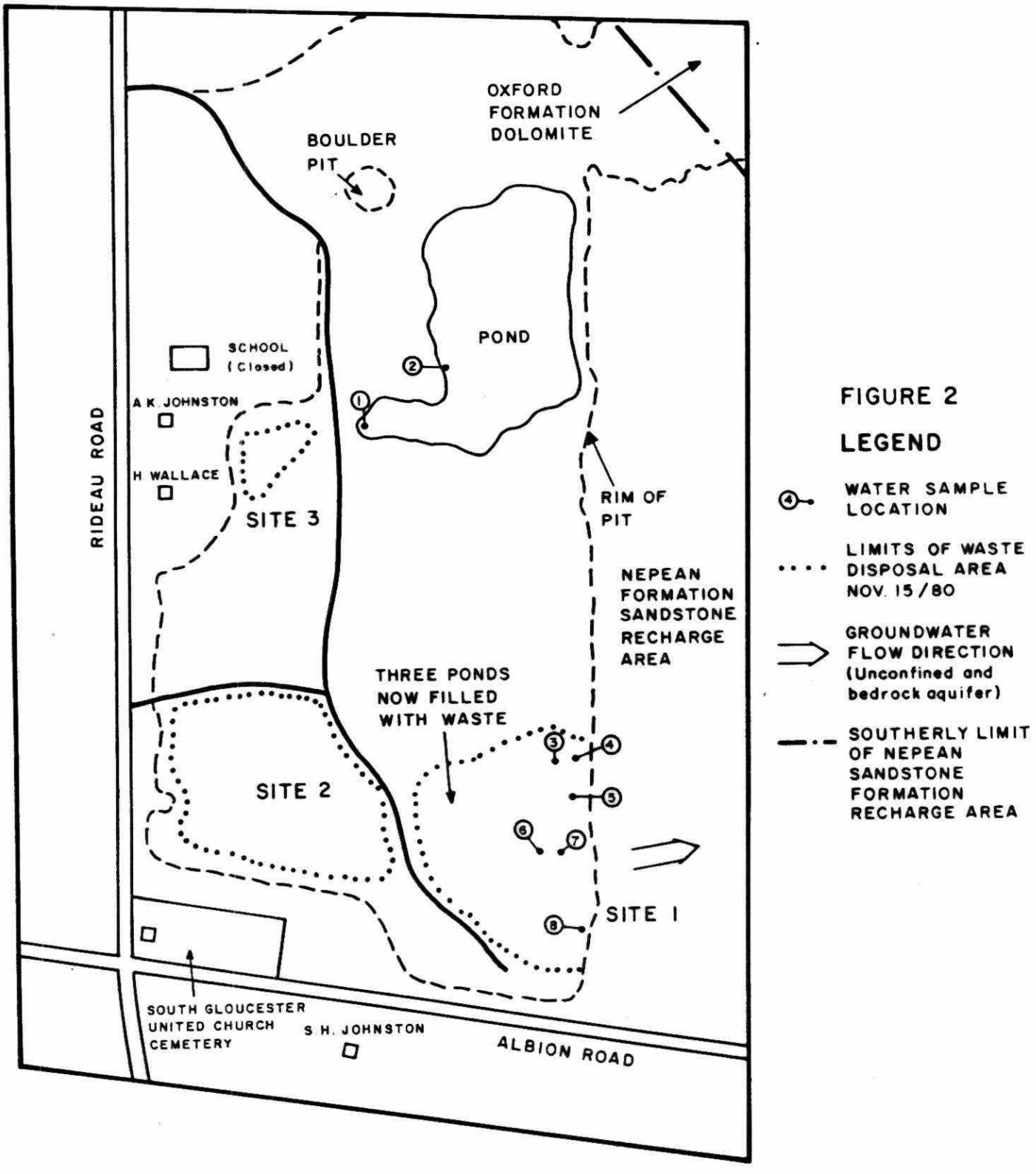


FIGURE 1

LOCATION MAP

GLOUCESTER SAND AND GRAVEL LTD. SITE


OXFORD
FORMATION
DOLOMITE
BOULDER
PIT
POND
SCHOOL
(Closed)
A K JOHNSTON
H WALLACE
RIDEAU ROAD
SITE 3
RIM OF
PIT
NEPEAN
FORMATION
SANDSTONE
RECHARGE
AREA
THREE PONDS
NOW FILLED
WITH WASTE
SITE 2
SITE 1
SOUTH GLOUCESTER
UNITED CHURCH
CEMETERY
S H. JOHNSTON
ALBION ROAD
FIGURE 2
LEGEND
WATER SAMPLE
LOCATION
LIMITS OF WASTE
DISPOSAL AREA
NOV. 15/80
GROUNDWATER
FLOW DIRECTION
(Unconfined and
bedrock aquifer)
SOUTHERLY LIMIT
OF NEPEAN
SANDSTONE
FORMATION
RECHARGE AREA

Ontario

MINISTRY OF THE ENVIRONMENT

0 25 50 100 m

METRES

GLOUCESTER SAND AND GRAVEL LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

GLOUCESTER SAND AND GRAVEL CO. SITE

LOCATION - Lot 26, Con. IV (RF)
- Gloucester Township
- Regional Municipality of Ottawa-Carleton

The site is an abandoned aggregate pit located southeast of Johnsons Corners, the intersection of Albion Road (Regional Road No. 25) and Rideau Road (Regional Road No. 8) (Figure No. 1)

OWNER - Gloucester Sand and Gravel Company
- Cohen and Cohen Ltd. are presently disposing of building waste at this site.

WASTE CHARACTERIZATION

There are 3 distinct areas of waste disposal on the property (Figure No. 2).

Site 1: - asphalt, red bricks, cinder blocks, roofing materials, cement, partially burnt wood, metal scrap, glass, electrical cables, discarded household appliances, insulation, siding materials, tar, burnt tires, plastics, tin plate, lighting fixtures, ABS pipe, clothing, paper, some domestic garbage.

Site 2: - cinder blocks, concrete, logs, wood, limestone boulders, bricks.

Site 3: - limestone boulders, mortar, wood tar, one T.V. set, asphalt, stone, wood, well casing, aluminum siding, concrete (steel reinforced), red bricks, scrap metal, no domestic waste visible.

SITE HISTORY

Aggregate operations took place on the property during the last several decades but have been largely discontinued at the present time. Some building waste was buried in the pit (Site 3) before 1978. A license which permitted the disposal of dry construction waste on the site was issued on 16 May 1978 and has subsequently been

reviewed on 31 July 1979 and on 20 August 1980. A water quality sampling program was undertaken by the Ministry of Environment (Ottawa office) during the summer of 1979 and a private water quality investigation was undertaken by G. A. Grant Consultants Ltd. of Nepean on behalf of the owner at the same time.

Disposal operations have apparently been restricted to Sites 1 and 2 since the initial permit was granted.

PRESENT USE OF THE SITE

The site is active. A great deal of material is currently being deposited at Site 1.

WASTE DISPOSAL PRACTICES

Construction waste at Sites 2 and 3 are simply dumped on the quarry floor and waste piles are not buried or modified in any manner.

Waste dumped by trucks at Site 3, is buried with a sand layer by a bulldozer about every 2 to 3 weeks. The sand cover varies from less than .3 m to .5 m in thickness. The total waste thickness at the site before burial varied from 1 to 2 metres. No excavation or trenching is conducted before burial. Waste in Site 1 has been buried up to the southern slope of the pit (Figure 2) and currently covers an estimated 3 to 4 hectare area.

Three ponds constructed by draglining of aggregate materials below the water table in pit floor have been filled with waste material in Site 1.

A partial recycling of wood, scrap metal and brick materials from the waste is being conducted manually by workmen.

SITE VEGETATION

The interior of the gravel pit is unvegetated. Some grasses and shrubs have become established on the sides and tops of the pit walls.

TABLE 1

SITE GEOLOGY

TIME	FORMATION	LITHOLOGY	DEPOSITIONAL HISTORY	REMARKS
CENOZOIC ERA PLEISTOCENE PERIOD	unconsolidated surficial materials	brown and grey coarse grained sand and gravel, dolomite and granitic pebbles coarse boulders to 2 m Ø abundant in basal eastern exposures of pit	Champlain Sea Deposit (10-12,000 years old) 24 m thickness before aggregate removal	mined to a depth of 8 m in the Gloucester Sand and Gravel Pit
NONCONFORMITY				
PALEOZOIC ERA	Oxford Formation	argillaceous dolomite	ancient marine sea deposit, 23.5 m thick	upper strate exposed in Bertrand Quarry east of site
	March Formation	dolomite and sandstone	as above, 12.5 m thick	exposed along Rideau Road at Beaver Asphalt Ltd. east of site
	Nepean Formation	sandstone	as above, total thickness unknown	underlies Gloucester Sand and Gravel Pit exposed near Beaver Asphalt Ltd.
NONCONFORMITY				
PRE-CAMBRIAN	Grenville Province	metamorphosed granitic and related rocks	forms basement complex	not exposed in study area

SITE DRAINAGE

All drainage within the Gloucester Sand and Gravel Pit is vertical with precipitation infiltrating the permeable surficial materials to the groundwater table. Water flow from the pit occurs only with the groundwater flow regime.

SITE TOPOGRAPHY

The existing pit floor is at an elevation of about 10.4 m A.S.L., a vertical distance of about 12 m below the intersection of Albion Road and Rideau Road. The pit walls vary from 0 to about 8 m in height.

SITE GEOLOGY

The stratigraphy of the South Gloucester area is summarized as Table 1 of this report. Table 2 summarizes the well log data for the four wells which are located within ½ km of the site.

The south Gloucester area is underlain by three bedrock formations of Paleozoic Age which overlie a basement complex of Precambrian Shield Rocks. The Nepean sandstone is the oldest of these units and is overlain in turn by a thin transitional sequence of dolomite and sandstone, called the March Formation and the Oxford Formation Dolomite. The Oxford Formation outcrops at the ground surface in many places east of the study area. Excellent exposures of the March and Nepean units are present in roadcuts along Regional Road 8, near Beaver Asphalt Ltd. Well log evidence indicates that the Gloucester Sand and Gravel site is underlain by these formations at a depth of 23.5 m. A kilometer east of the site, the bedrock surface rises and dolomite strate of the overlying Oxford Formation outcrop.

The surficial material in the Johnston Corners area is composed of a 23.5 m (78') thickness of sand and gravel. This unit is originally of glaciofluvial origin but was reworked during the recession of the Champlain Sea from this region. Prominent northeast to southwest oriented strand lines are evident on aerial photos of the area.

Five pits were dug in the vicinity of waste Site No. 1, on the property. Materials encountered in the 2 m below the existing pit floor included horizontally stratified fine silty sand and medium grained sand. Current structures, including laminations

Well No.	Con No.	Lot No.	Csg Dia Ins	Kind of H_2O	Water Found Feet	Stat Lvl Feet	Pump Lvl Feet	Test Rate GPM	Test Time Hr/Mn	H_2O Use	Owner/Log Depths in feet to which Formations Extend
1	4	26	5	FR	83	31	9	52	1/00		Cemetery tpsl 008 m sand 075 grvl 078 is 83
2	4	26	5	FR	95	45	10	47	1/00		Johnson K M sand bldr 0090 white ss 0095
3	4	26	5	FR	86	34	10	38	1/00		School M sand 0086 lmsn 130
4	4	26	5	FR	49	12	4	12	1/00		Norlock A (now Wallace) grvl M sand 049

No water well available for S.H. Johnston residence on Rideau Road.

TABLE 2: WATER WELL LOGS FROM ADJACENT WELLS

and cross bedding were evident. Lenses of coarser grained more permeable sand were present in all pits while gravel materials were absent.

Pit walls are typified by channel and current structures, with discontinuous pebbly and bouldery gravel strata and lenses interbedded with finer sand deposits. The pit floor was .5 to 1.5 m above the groundwater table in November 1980.

Based on this evidence, it is likely that coarser high permeability, gravel formations occur at depths beneath the individual waste disposal sites. The extent and continuity of these strata is unknown.

SITE HYDROGEOLOGY

During the summer of 1979, an extensive test drilling and hydrogeological investigation was conducted by Water and Earth Science Associates Ltd., for the Ministry of the Environment. (Reported in Oliver, Mangione Ltd. Report, September, 1979). Our work identified the following characteristics of the hydrogeology of the study area.

The Gloucester Sand and Gravel Pit lies within the recharge area for the Nepean sandstone. This aquifer is confined by a thickness of black Oxford Formation. Dolomite to the east and south of the study site. Groundwater flow in the Nepean sandstone is most likely in a southerly or southeasterly direction in the Johnstons Corners area, based on a potentiometric examination of over 150 wells in the south Gloucester region. Flow and recharge in the Oxford Formation is localized and shows a radial flow pattern from the intersection of Rideau Road and Highway No. 31, east of the study pit. There is apparently no hydraulic connection between the overlying dolomite and underlying aquifers in this area, thereby protecting the integrity of the lower waterbearing zones.

There is no evidence at present from beneath or adjacent to the Gloucester Sand and Gravel Pit to indicate whether there is a vertical downward component of the groundwater flow regime or a surficial/bedrock hydraulic connection. However, near surface groundwater movement through the permeable sand and gravels which underlie

the Gloucester pit is apparently in a southerly and southeasterly direction, based on the following evidence:

1) the elevations of groundwater in ponds in and adjacent to the Gloucester pit,

2) the excellent existing chemistry of the wells north of the disposal site (see following section)

3) field observations of leachate movement and chemical analyses of water from test pits east, south and west of the Site 1 disposal area.

RESULTS OF PREVIOUS INVESTIGATIONS

The results of a water quality investigation reported on 20 September 1979, by the Ministry of Environment is included as Table 3 of this report. Based on the groundwater geochemistry which is characteristic of this area, two anamalous results can be distinguished in these analyses.

A) S. H. Johnston Well

A chloride reading of 157 PPm and the location of this well adjacent to Albion Road, suggests that road salt contamination of this water supply has occurred. The cause of a high acidity reading in this well is unknown.

B) Phenol

Gibbs phenol readings are in excess of drinking water standards in the Wallace, A. K. Johnston and S. H. Johnston wells. The origin of this contamination is unknown but field evidence strongly suggests that this problem is unrelated to the disposal operations in the Gloucester Sand and Gravel Pit.

A water chemical survey was conducted in September 1979 by G. A. Grant Scientific Consultants Ltd. of Ottawa. Two samples (G_1 and G_2) were taken from backhoe dug test pits located near Site 3. The results of this survey, dated 28 September 1980, are included as Table 4.

TABLE 3 ANALYTICAL RESULTS (Ministry of the Environment, 20 September 1979)

	Gibbs Phenol (PPb)	Chloride (PPm)	Flouride (PPm)	Sulphate (PPm)	Acidity	Alkalinity (PPm $CaCo^3$)	Conductivity (uMHos/cm)	Suspended solids (PPm)	Dissolved solids (PPm)	Hardness (PPm)	pH	Na (PPm)	K (PPm)
Mrs. H. Wallace	6	18	0.1	32	1.87	112	320	<15	185	160	8.0	2	1.3
A.K. Johnston	4	15	0.1	32	1.97	94	320	<15	180	160	8.0	3	1.2
S.H. Johnston	6	157	0.1	45	15.2	241	1030	<15	885	476	7.5	21	1.5
United Church	0	33	0.1	39	4.23	168	485	<15	320	244	7.8	3	1.4

Trace Elements (in PPm)

	Copper	Iron	Manganese	Zinc	Barium	Cadmium	Chromium	Molybdenum	Arsenic	Magnesium	Calcium	Selenium
Mrs. H. Wallace	<.01	0.15	0.02	0.07	0.16	<.005	<.02	<.02	<.001	13.0	52.0	<.001
A.K. Johnston	<.01	0.15	0.02	0.05	0.14	<.005	<.02	<.02	<.001	13.0	53.0	<.001
S.H. Johnston	<.01	< 0.2	<0.01	0.20	0.40	<.005	<.02	<.02	<.001	42.0	160.0	<.001
United Church	<.01	0.90	0.02	0.40	0.24	<.005	<.02	<.02	<.001	23.0	89.0	<.001

Additional samples during the summer of 1979 by this company showed the results indicates on Table 5.

An analysis of this data indicates that a strong leachate is not being produced at this site at this time. High iron values are reported but this is typical of groundwater in sand material due to dissolution of the Ferric oxide grain coatings.

A higher than ambient level nitrate concentration of 4.04 mg/ℓ(G1, Aug. 21, 1979) is the only anomalous value in these very comprehensive analyses. The cause of this reading is unknown.

ECOLOGICAL SENSITIVITY

There is no evidence of surface ecological damage in areas adjacent to the existing waste sites other than those associated with extraction activities.

GAS TESTING

Negative readings were measured throughout both Sites 2 and 3 where over 15 shallow holes were tested in the pit floor and in piles of waste material.

At Site 1, a trace reading (<5% combustible gases) was registered directly in the waste material, just north of Test Pit 6. When Test Pit 6 was dug, bubbling gas was observed in the groundwater which filled the pit to within 50 cm of the ground surface. This gas gradually dissipated.

WELL WATER TESTING

Water samples from the Wallace and S. H. Johnston wells were tested in the field and showed no evidence of leachate (Appendix A).

Table 4: G.A. Grant Consultants Ltd.
Analytical Results

	G1	G2
Arsenic (As) mg/l	<0.01	<0.01
Chloride (Cl) mg/l	5.3	5.8
Fluoride (f) mg/l	<0.01	<0.01
Nitrate (NO_3) mg/l	1.7	2.8
Sulphate (SO_4) mg/l	23	28
Sulphide (s) mg/l	<0.01	<0.01
Alkalinity (as $CaCO_3$)mg/l	95	100
Chemical Oxygen Demand (COD) mg/l	<0.1	<0.1
pH	7.9	7.5
Phenol ppb	<0.001	<0.001
Specific Conductance, mhos	230	280
Dissolved Solids, mg/l	199	242
Hardness (as $CaCO_3$) mg/l	129	142
Silver (Ag) mg/l	<0.05	<0.05
Aluminum (Al) mg/l	3	4
Arsenic (As) mg/l	<0.05	<0.05
Chromium (Cr) mg/l	<0.05	<0.05
Boron (B) mg/l	0.1	0.2
Barium (Ba) mg/l	<0.05	0.1
Calcium (Ca) mg/l	<0.05	<0.05
Cadmium (Cd) mg/l	<0.01	<0.01
Cobalt (Co) mg/l	<0.05	0.1
Copper (Cu) mg/l	0.1	0.1
Iron (Fe) mg/l	2.5	2.7
Potassium (K) mg/l	1.0	1.0
Magnesium (Mg)mg/l	<0.05	<0.05
Manganese (Mn) mg/l	0.2	<0.05
Molybdenum (Mo) mg/l	<0.05	<0.05
Sodium (Na) mg/l	<0.05	<0.05
Nickel (Ni) mg/l	<0.05	<0.05
Phpsphorus (P) mg/l	<0.05	<0.05
Lead (Pb) mg/l	0.1	<0.05
Antimony (Sb) mg/l	<0.05	<0.05
Selenium (Se) mg/l	<0.05	<0.05
Silicon (Si) mg/l	4	4
Tin (Sn) mg/l	<0.05	<0.05
Titanium (Ti) mg/l	<0.05	0.1
Vanadium (V) mg/l	<0.01	0.2
Tungsten (W) mg/l	<0.05	<0.05
Zinc (Zn) mg/l	1	0.2

Sample No.	*Chlorides	Fluoride	Sulphate	Sulphide	Nitrates	Alkalinity	Hardness	Dissolved Solids	Conduct-ance mhos	PH	Phenol PPB
G1-Aug.20/79	5.3	<0.01	23	<0.01	1.7	95	129	199	230	7.9	<0.001
G2	5.8	<0.01	28	<0.01	2.8	100	142	242	280	7.5	<0.001
G1 Aug. 21/79	4.0	-	39	-	4.04	220	263	-	495	-	-
G2	3.0	-	52	-	2.44	204	246	-	490	-	-

*Reported as mg per liter

Table 5: G.A. Grant Consultants Ltd.
Sample Results

LEACHATE TESTING

A sample from the pond southeast of Site No. 2 did not show evidence of chemical contamination when field tested. A 1 m deep hand dug test pit, 20 m southeast of the exposed garbage (Station 3 on Figure 2) has a significantly higher iron, conductivity and hardness than the pond. The sample has a strong hydrocarbon odour, contained oily materials and had a high turbidity.

After consultation with Ray Amell, M.O.E. Cornwall, a backhoe was rented and 4 additional test pits (Figure 2) were dug to below the water table. The analytical results from 3 bulk samples from Pits 4, 7 and 8 are outlined below and are summarized as Table 6. Test Pit 6 was not sampled because of the extreme degree of physical contamination in the pit (black colour, heavy petrochemical and burnt wood smell, gas production). This water ha a 920 uMHos/cm conductivity and a PH of 7.50. It was obviously a strong leachate.

Test Pit 4

In comparison to the groundwater in the pond at Station 1, this sample has a high suspended and total solids concentration. The C.O.D., B.O.D. and total kjeldahl nitrogen values indicate the water is contaminated and can be classified as a weak leachate.

Test Pit 7

This pit showed a grey anoxic reducing environment below the water table. A strong hydrocarbon odour was present. The analysis shows very high B.O.D., C.O.D., ammonia, hardness, phenol, sulphate and suspended solids concentrations. The sample can be classified as a strong leachate.

This pit is located at the southern limit of excavation in the pit and is less than 10 m from buried, sand covered waste.

Test Pit 8

This pit had the grey sand colour as in Test Pit 7 but only a slight odour. The analysis shows an elevated hardness, B.O.D., C.O.D., ammonia, total Kjeldhal nitrogen and sulphate. The sample is a moderately strong leachate.

Sample	PH (units)	Cl^-	Susp. Solids	TDS	Phenol (PPb)	Hardness ($CaCo_3$)	Alkalinity ($CaCo_3$)	B.O.D 5 Day	C.O.D	Ammonia
TP 4	7.9	5.0	629	864	<5	450	123	3	8	0.73
TP 7	7.5	none	258	600	1240	900	825	124	240	2.91
TP 8	7.5	2.0	170	530	<5	780	545	20	28	2.74

	Total Kjedhal N.	Sulphate	Nitrate
TP 4	12.25	42	1.00
TP 7	6.19	195	0.43
TP 8	2.80	349	0.86

(* Concentrations in mg/l unless indicated)

Table 6: Water Analyses from Test Pits
(Bulk Samples Taken 22 November 1980)

CONCLUSIONS

Based on the above mentioned results, it can be concluded that a leachate plume is moving in a southerly direction from Site 1. A variety of waste materials from the demolition of burnt buildings has been buried and piled here since May 1978. The leachate plume is less concentrated, as would be expected, both east and west of the primary flow direction. The leachate plume has already migrated off of the Gloucester Sand and Gravel Ltd. property.

Combustible gas is being produced in the waste material and accumulates after the burial with a sand cover.

Homes north and west of the property have not been adversely affected by well contamination or gas problems because of their distance from the site and the southerly direction of groundwater flow.

There is no evidence of ecological damage in areas adjacent to the pit, although the land has been obviously heavily man altered by extraction activities.

RECOMMENDATIONS

Site 1 should be monitored to determine:

1) the groundwater flow regime,
2) the vertical movement of groundwater in relationship to the Nepean sandstone recharge area,
3) the geochemistry of the leachate being produced at the site,
4) the velocity, direction and attenuation of leachate movement, and
5) the production and distribution of gases within the buried waste material.

A series of 6 to 8 multilevel piezometer nests would be required to determine the above mentioned information. Two stations should be located north of Site 1 to evaluate the possibility of contaminant migration in this area.

Piezometers should be sampled on a regular basis and gas production should be checked.

The requirement for a leachate treatment plan and future waste disposal activities at the site should be evaluated in light of leachate plume delineation and movement velocity information.

The disposal site and future uses should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-law for the disposal site to restrict future uses,

(c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

(d) prohibit future residential development on the disposal site and a limited buffer zone around this site.

APPENDIX A

FIELD ANALYSIS SHEETS

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 1
Industrial Site Identification Study

MOE Region Southeastern Date Nov.9/80 Company Name Water and Earth Science Assoc. Ltd. and Gore & Storrie Limited

Site Gloucester Sand and Gravel Pit, Lot 26, Con IV(RF) Gloucester Township

(Lot, concession #, or UTM coordinates, name, address)

1 Leachate

ON-SITE TESTS

A. Water bodies within 100 Metres

Test Pits

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity										
5) Conductivity				195	320	920	1500	780		
6) pH				8.80	7.80	7.50	6.85	7.29		
7) Hardness										
8) Sulphates										
9) Temperature (°C)				3	4	4	3	4		
10) _____										

B. Wells within 100 Metres

Parameter	Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity										
5) Conductivity										
6) pH										
7) Hardness										
8) Sulphates										
9) _____										
10) _____										

Lab Tests (2 Litre Samples)

Required, Yes X No _____ If yes, complete Form II, Lab Analysis. If no, go to Part 2, Gas.

Samples from T.P. 4, 7, 8

2 Gas

C. On-site

Test Holes	CH_4		
#X 6	yes, strong odour		
#2			
#3			
#4			
#5			

D. Buildings

Name/Address	CH_4		
1. none tested			
2.			
3.			
4.			
5.			

3 General Coments (vegetation, leachate springs, depth, odours, etc.)

strong southerly movement of leachate with groundwater flow regime

(Detail all test point locations in a sketch on reverse side)

Form completed by D. P. Smith

1666

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 1
Industrial Site Identification Study

MOE Region Southeastern Date Oct.28/80 Company Name Water & Earth Sciences Assoc. Ltd. and Gore & Storrie Limited

Site Gloucester Sand and Gravel Pit, Lot 26, Con. IV (RF) Gloucester Township
(Lot, concession #, or UTM coordinates, name, address)

1 Leachate

ON-SITE TESTS

A. Water bodies within 100 Metres

Parameter	No.1 Pond	No.2 Pond	Test Pit No.3	4	5	6	7	8	9	10	
	Results 1	2	3								
1) Chlorides	<25	<25	375								in PPm
2) TDS											
3) Suspended Solids											
4) Alkalinity	206	210	574								
5) Conductivity	125	125	460								
6) pH	7±	7±	7±								
7) Hardness	118	120	310								
8) Sulphates											
9) Iron	0	0	.25								
10) Color/Turbidity	-	-	high								

B. Wells within 100 Metres

Parameter	Wallace well	White farmhouse (S.K. Johnston)	3	4	5	6	7	8	9	10	
	Results 1	2	3								
1) Chlorides	62.5		312								in PPm
2) TDS											
3) Suspended Solids											
4) Alkalinity	236		318								
5) Conductivity	300		800								
6) pH	7±		7±								
7) Hardness	180		420								
8) Sulphates											
9) Iron	.06		.02								
10) Clolr/Turbidity	-		-								

Test Pit 20 m SE of Resuse

Lab Tests (2 Litre Samples)

Required, Yes X No _____ If yes, complete Form II, Lab Analysis. If no, go to Part 2, Gas.

2 Gas

C. On-site 15-20 shallow holes

D. Buildings None adjacent to site

Test Holes	CH_4			Name/Address	CH_4		
#1	Trace in garbage in one hole only			1.			
#2	Just north of Test Pit No. 6			2.			
#3				3.			
#4				4.			
#5				5.			

3 General Coments (vegetation, leachate springs, depth, odours, etc.)
burnt wood odor, rats, some growth of algae in pond, blowing paper

(Detail all test point locations in a sketch on reverse side)
on aerial photo (Figure 2)

Form completed by D. P. Smith

1666

MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

H. M. GRANT LTD. SITE GLOUCESTER TWP.

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

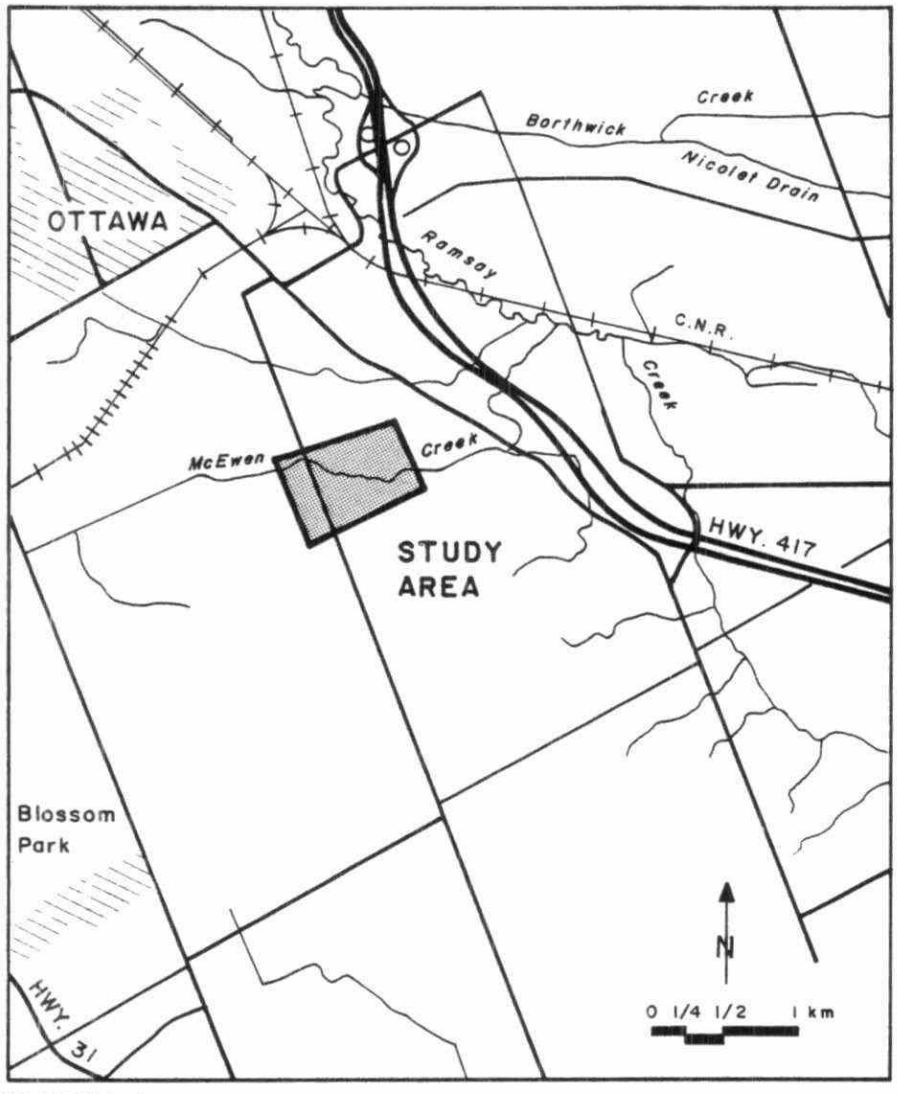


FIGURE 1

LOCATION MAP

H. M. GRANT LTD. SITE

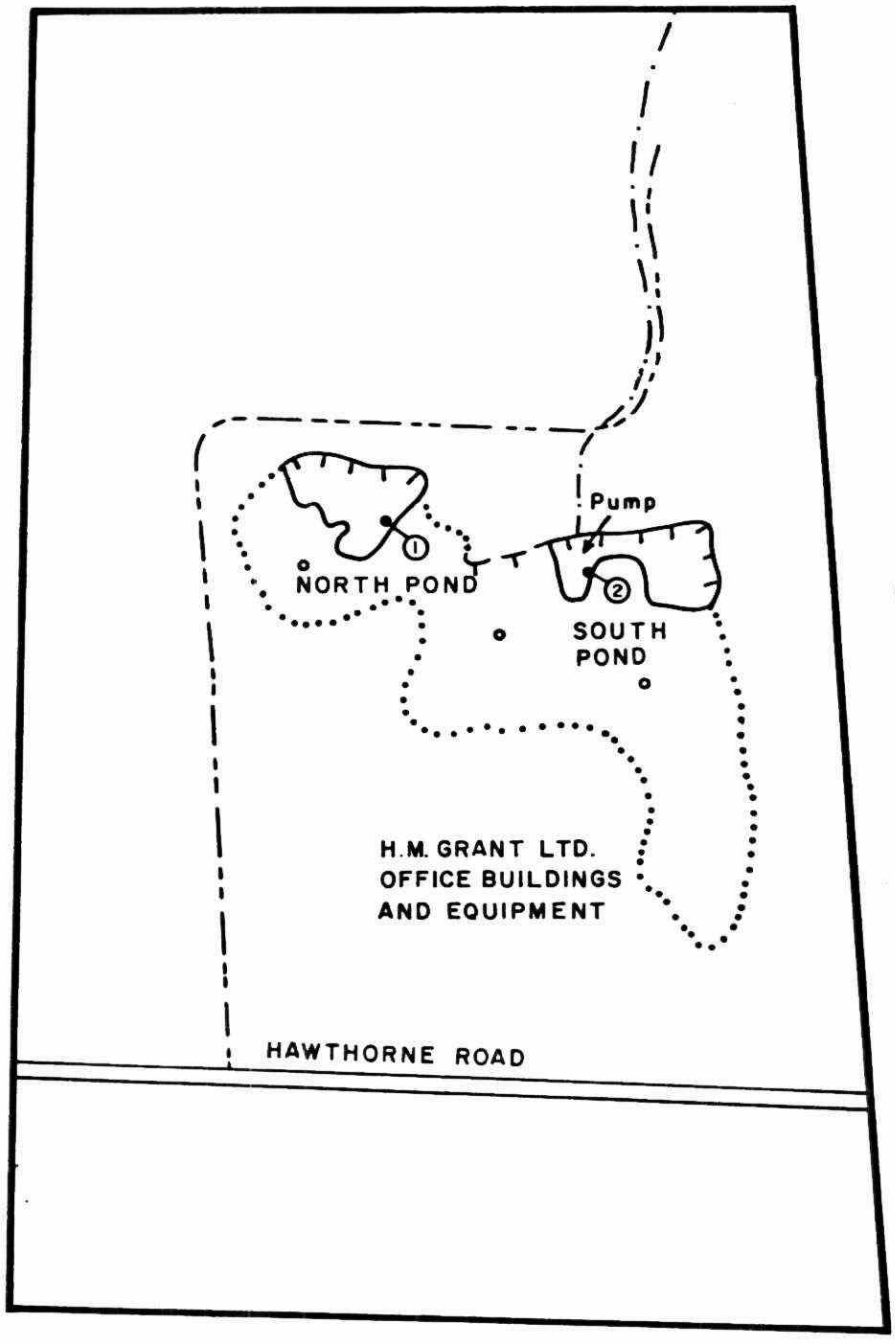


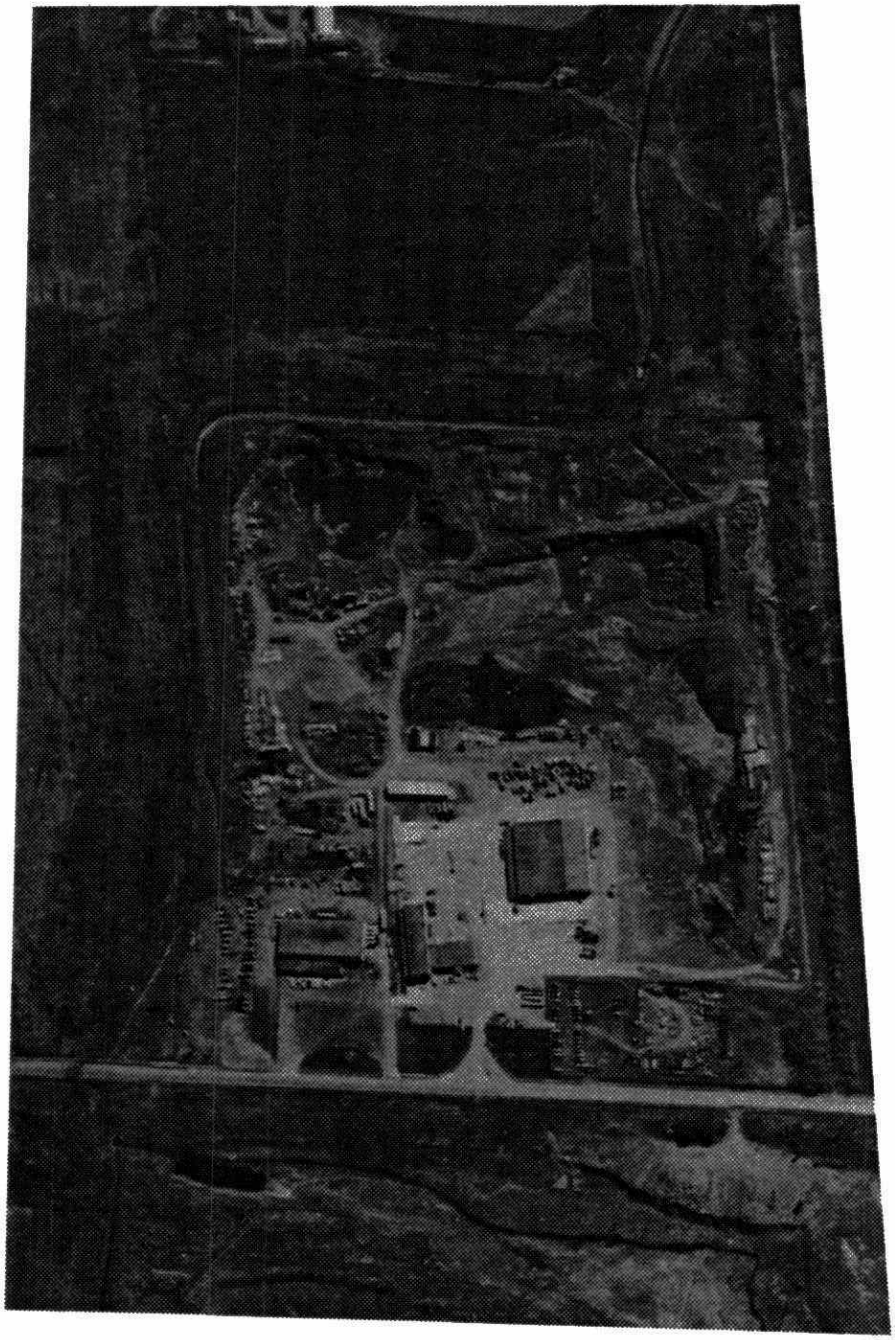
FIGURE 2

LEGEND

- LIMIT OF WASTE DISPOSAL AREA
- ROCK ESCARPMENTS
- WATER SAMPLE LOCATION
- GAS SAMPLING HOLE
- CREEK TRIBUTARY
- SEWER LINE AND BERM

Ontario

MINISTRY OF THE ENVIRONMENT



0 25 50 100 m

METRES

H. M. GRANT LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

H. M. GRANT SITE

LOCATION - The H. M. Grant site is located on Hawthorne Road in the Township of Gloucester, southeast of the City of Ottawa. (Figure No. 1).

OWNER - H. M. Grant Ltd. (construction company). The disposal site is located in the quarry behind the office and storage buildings of the Firm. The buildings were constructed in 1961.

SITE HISTORY (as per interview with Manager, H. M. Grant Ltd.)

The quarry was opened to provide aggregate material for the building of No. 417 Highway in 1974. The company was given a dry construction waste disposal permit at that time. Some municipal waste was dumped into the pit but this was completely stopped by Christmas of 1976. Only dry waste, such as stumps, earth, concrete and rock were dumped in the pit after this time.

In March 1977, during the construction of a storm sewer along the northern boundary of the site, a particularly severe spring runoff event resulted in excess flow entering and flooding the quarry. A hydrogen sulphide gas problem was noted subsequent to the pumping out of the quarry, which caused some complaints during the summer of 1977. Since 1976, only small amounts of fill material have been disposed of in the quarry.

WASTE CHARACTERIZATION

Concrete blocks, metal scrap, bricks, natural boulder, clay and sand fill materials; stumps and some municipal garbage prior to 1976.

BEDROCK GEOLOGY

Bedrock is exposed along much of the eastern pit face of the quarry. The thinly stratified grey and black shales, sandy shale and dolomitic strata are part of the Carlsbad Formation.

SURFICIAL GEOLOGY

There are no surficial geological materials left in the disposal site area due to the construction of the H. M. Grant Ltd. yard and the quarrying activities.

SITE DRAINAGE

Two bodies of water are present in the disposal quarry (north and south ponds Figure No. 2). Water from the south pond is pumped eastwards into the McEwen Creek, a tributary of Green Creek and the Ottawa River. Pumping presumably is necessary in the spring and after rainfall events. It is not known if the two ponds are hydraulically connected.

SITE HYDROLOGY

The fill materials in the site appear to be clay rich and have a low hydraulic conductivity. The quarry walls (Figure No. 2) are moderately fractured and some water movement through the bedrock to the east is likely occurring. No hydrogeological investigations of this area have been carried out.

There are no wells within 1 km of the site.

SITE VEGETATION

There is no vegetation on or near the disposal area.

ECOLOGICAL SENSITIVITY

The disposal quarry is not sensitive to further ecological alteration because it has already been totally man altered.

LEACHATE ANALYSIS

Water samples were taken from both the north and south ponds for chemical analysis. Preliminary field chemistry results are included as Appendix A.

An oil slick was noticed on the southern pond and both water bodies were highly turbid. Bulk samples from both ponds were taken and results are reported as Table No. 1.

TABLE NO. 1

BULK CHEMISTRY RESULTS

Location	Ph	Chloride	Suspended Solids	TDS	Phenol	Hardness	Sodium	Alkalinity	Sulphate
North Pond	7.9	1.5	7	960	<5	520	0.49	567	162
South Pond	7.5	6.5	50	1140	6	400	1.96	350	167

The only anomalous result is the 6 PPb phenol reading in the southern pond. This may be associated with the hydrocarbon slick on the water surface.

The leachate discharge is to the McEwen Creek and then subsequently to the Green Creek and the Ottawa River. Land use along the McEwen Creek is largely farming and primarily dairy production. There is access to the creek by cattle for watering purposes.

GAS TESTING

The impermeable nature of the fill material and the high boulder and cement block content made gas testing impossible. The materials in the disposal pit have been very densely compacted by heavy equipment.

A hydrogen sulphide odour could be smelt around the southern pond but was not detected in northern areas of the site.

CONCLUSIONS

The H. M. Grant disposal area has received a combination of dry construction materials and municipal waste between 1971 and 1976. The site is essentially inactive at present.

The quarry site is heavily man impacted and is devoid of vegetation. A minor gas smell is present at the southern pond in the pit but was the only gas detected at the site. There are no wells near the pit.

There are no leachate springs in the quarry and bulk chemical samples from each of the two ponds showed no evidence of strong leachate production. A 6 PPb phenol reading in the southern pond may be related to some movement of contaminated groundwater into this water body.

RECOMMENDATIONS

Although no evidence of strong leachate production was noted, this can be influenced somewhat by antecedent rainfall and runoff conditions as well as the time lapse from the previous pumping operation. Because of the previous use of the quarry in receiving municipal refuse and the evidence of hydrogen sulphide production, it is recommended that:

(a) additional leachate monitoring and analysis be undertaken to determine more accurately the characterization of this waste and the possible need for treatment. Deeper levels of the pits should be sampled to determine whether thermal or chemical stratification of the ponds is occurring. The discharge to McEwen Creek should also be analyzed when the ponds are pumped out the next time,

(b) additional test drilling be undertaken on the site to establish the limits and characterization of the waste and the distribution and type of gas being produced.

The disposal site and future used should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-law for the disposal site to restrict future uses,

(c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

(d) prohibit future residential development on the disposal site and a limited buffer zone around this site.

APPENDIX A

FIELD ANALYSIS SHEET

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 1
Industrial Site Identification Study

MOE Region Southeastern Date Oct.29/80 Company Name Water & Earth Science Associates Ltd. and Gore & Storrie Limited

Site H. M. Grant Ltd.
(Lot, concession #, or UTM coordinates, name, address)

1 Leachate

ON-SITE TESTS

A. Water bodies within 100 Metres

Parameter	North	South							
	1	2	3	4	5	6	7	8	9	10
1) Chlorides		137	238							
2) TDS										
3) Suspended Solids										
4) Alkalinity		610	600							
5) Conductivity		980	1220							
6) pH		7.60	7.55							
7) Hardness		380	325							
8) Sulphates										
9) Iron		.10	.08							
10) Colour		low	low							
Odour		Nil	H_2S							

B. Wells within 100 Metres

None

Parameter	Results									
	1	2	3	4	5	6	7	8	9	10
1) Chlorides										
2) TDS										
3) Suspended Solids										
4) Alkalinity										
5) Conductivity										
6) pH										
7) Hardness										
8) Sulphates										
9)										
10)										

Lab Tests (2 Litre Samples)

Required, Yes X No _____ If yes , complete Form II,Lab Analysis. If no,go to Part 2, Gas.

2 Gas

C. On-site

Test Holes	CH_4		
#1	All Sites		
#2	Negative		
#3			
#4	Odour at South Pond		
#5			

D. Buildings

Name/Address	CH_4		
1.			
2.			
3.			
4.			
5.			

3 General Coments (vegetation, leachate springs, depth, odours, etc.)

quarry, no leachate springs, no vegetation

(Detail all test point locations in a sketch on reverse side)

Form completed by D. P. Smith

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MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

E. MACDOUGALL LTD. SITE ELIZABETHTOWN TWP.

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

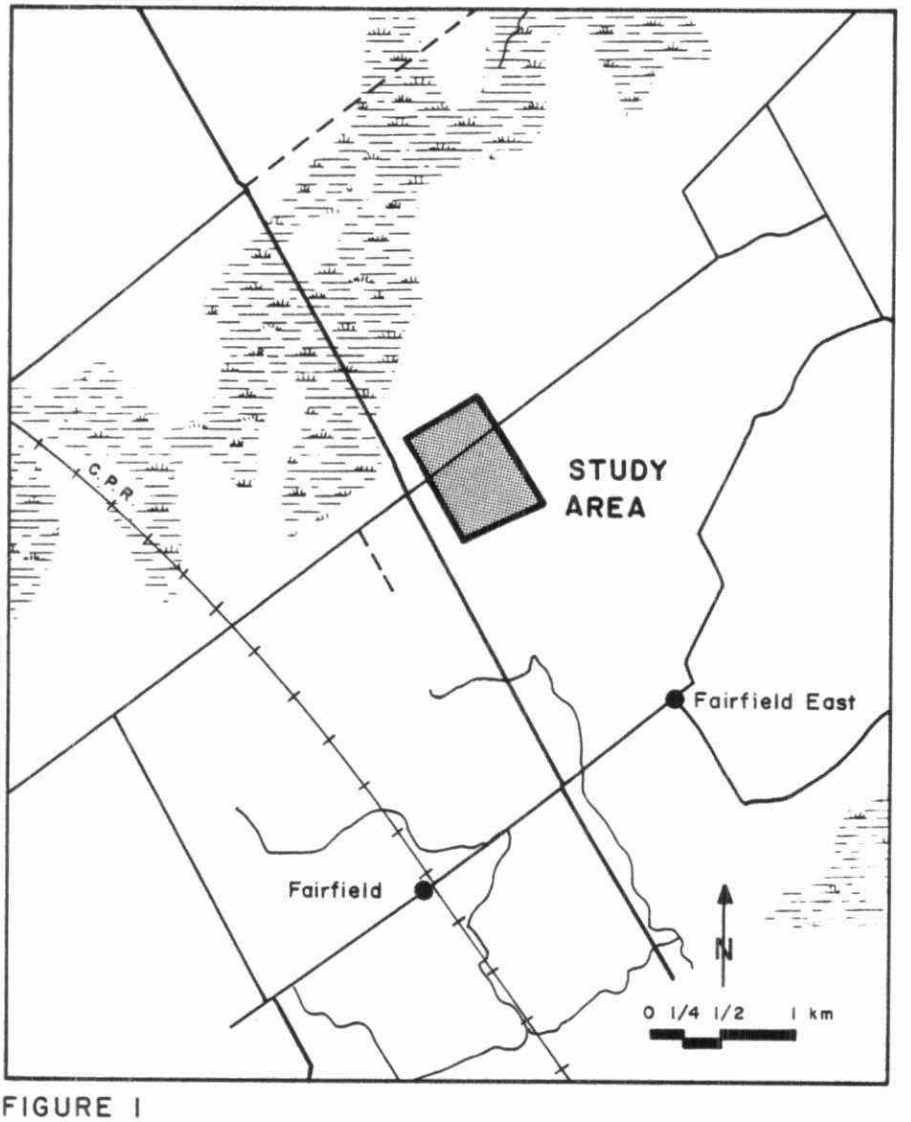
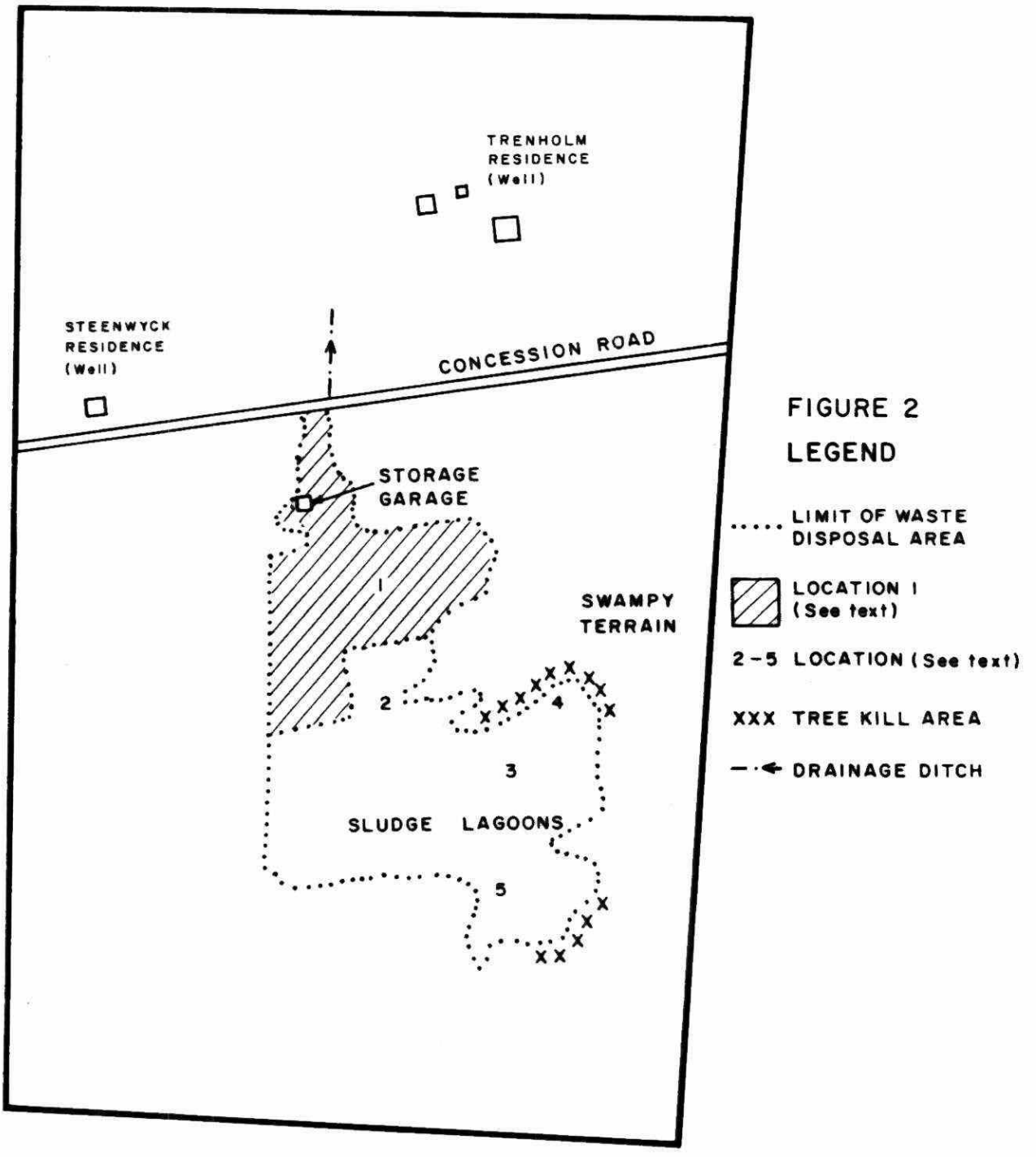


FIGURE 1

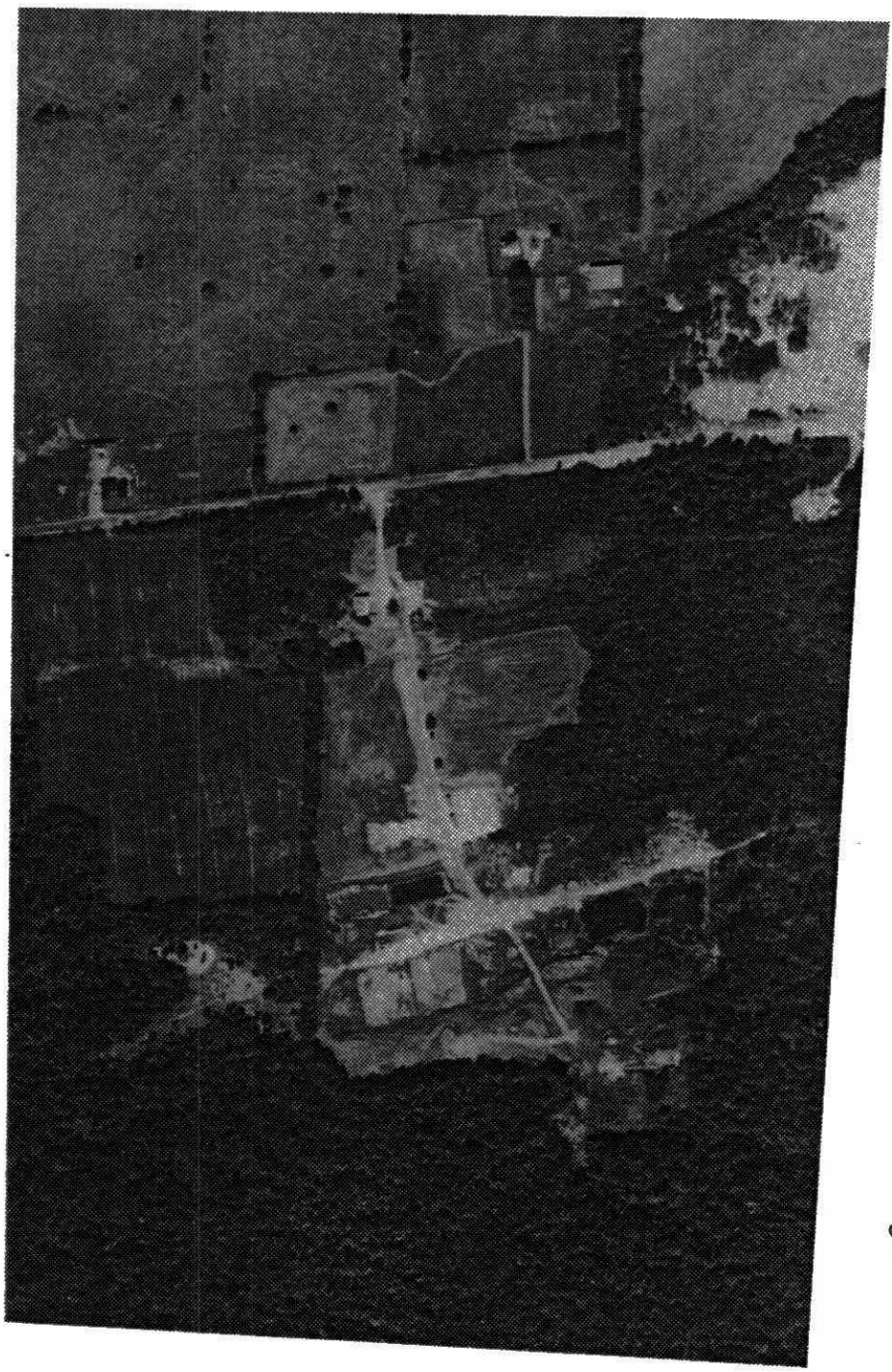
LOCATION MAP

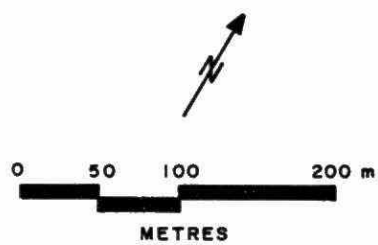
E. MACDOUGALL LTD. SITE


TRENHOLM
RESIDENCE
(Well)
STEENWYCK
RESIDENCE
(Well)
CONCESSION ROAD
STORAGE
GARAGE
1
SWAMPY
TERRAIN
2
4
3
SLUDGE LAGOONS
5
FIGURE 2
LEGEND
LIMIT OF WASTE
DISPOSAL AREA
LOCATION 1
(See text)
2-5 LOCATION (See text)
XXX TREE KILL AREA
DRAINAGE DITCH

Ontario

MINISTRY OF THE ENVIRONMENT





E. MACDOUGALL LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

MACDOUGALL SITE

LOCATION - Lot 5, Concession 5, Township of Elizabethtown.
Mr. MacDougall owns about 80 acres in this location. The site is located as shown on Figure No. 1.

OWNER - Mr. Earl MacDougall

SITE HISTORY

The site has been licensed since about 1962 for the disposal of septic tank waste. Liquid industrial waste was dumped at the site for about 11 years, from 1962 to 1973. For the past 5 years, digested sludge has been disposed of in lagoons on the property.

Both septic tank waste and digested sludge are presently being brought to the site. It is understood that Mr. MacDougall is using the site as a liquid industrial waste transfer station but this material is not being deposited on the property.

As of April 1979, the site did not have a Certificate of Approval for a transfer station or a sludge disposal site. Approvals to operate spreading fields were given in June 1979.

A hydrogeological investigation is underway currently on the property to meet the information requirements for the necessary approvals.

WASTE CHARACTERIZATION

Our field investigations revealed the following information about the waste buried on the site. Station numbers are located on Figure No. 2 and correspond to the descriptions below.

Location 1

Area where septic tank effluent has been spread on sand surface. Topsoil has been removed and placed in long berms. An orangey or green crust has

formed on the ground surface in irregular patches. A slight sewage odour is present in this area.

Location 2

Six large gas storage tanks are located here. A puddle underneath one tank has a fairly bright green colour.

Location 3

Sludge lagoons with approximately 2 m high sandy berms. The sludge is in various stages of dessication and several lagoons are currently active. Some of the lagoons appear to also have had oil dumped in them.

Location 4

Area of chemical waste and empty 45 gallon drum (approximately 200) deposition. Toluol, ethylene chloride, inks and laquers are labelled on individual drum sides. A considerable amount of dry domestic refuse, building waste, metal scrap and some domestic wet garbage has been piled in this area.

Most of the drums are partially rusted.

Location 5

Area where many old chemical drums have been disposed. Most of these are heavily rusted.

Twenty-eight younger but empty Reichold laquer and ink drums are piled just north of this location.

In addition, there are several derelict fuel oil trucks on the site which were used for hauling waste. Numerous small depressions in the sandy ground surface are coloured (red, browns, green) indicating the infiltration of some chemical substance concentrated more at site Location 4, but are present throughout the lagoon areas of the site.

A review of the Ministry of the Environment file revealed the following pertinent information:

a) liquid waste was disposed of in shallow 1 m or less deep pits in the sand surface. (These features are not evident in the field now).

b) liquid industrial wastes were stored at least to September 1977, in the large storage tanks mentioned at Location 2.

c) the chemistry of the industrial wastes dumped at the site is unknown.

PRESENT USE OF THE SITE

The site is active and is receiving digested sludge from Brockville, Prescott, Kingston Township, Carleton Place and the Merrickville sewage treatment site. Local septic tank wastes are being spread on the land.

SITE VEGETATION

Parts of the site are covered with early successional grasses and shrubs. Property boundaries are marked by mature hedgerows to the west and north and dense forest to the south and east. Part of Location 1 is largely devoid of vegetation.

SITE DRAINAGE

A M.O.E. Report by T. A. Mclelwain, July 1980, describes the site drainage as follows, "Much of the MacDougall site is seasonally swampy in nature and during periods of high water table conditions, in the spring of the year, a surface water course is established, which carries surface water to a ditch which flows east along the south side of the 6th Concession Road. The ditch crosses the road via a culvert, and flows north across a field, eventually entering the surficially exposed bedrock at a point approximately 90 metres north of the entrance to the MacDougall site, and approximately 300 metres east of Mr. Steenwyck's well". (Property located 300 m northwest of the site). During a field inspection on May 9, 1980, "an estimated 65 litres of water per minute were entering the bedrock through fissures up to 0.5 metres wide. The water was traced by sight and sound in the bedrock for a distance of approximately 50 metres to the west, towards Mr. Steenwyck's residence. The water had a yellow colour and a swampy odour".

SITE TOPOGRAPHY

The site is very flat with some slope to the northwest. The groundsurface has local depressions which pond precipitation and enhance infiltration.

RESIDENCES NEAR THE DISPOSAL SITE

Four residences are located north of the site along Concession Roads of Elizabethtown Township (see Figure No. 2).

ECOLOGICAL DAMAGE

Two major areas of vegetation kill are present on the site and are indicated on Figure No. 2.

SITE GEOLOGY

Bedrock does not outcrop on or near the property. Existing published maps indicate the site is underlain by dolomite and sandstone strata of the March Formation. A table summarizing the geology and hydrogeology of this area is included as Table No. 1.

Published well logs for the site area are included as Table No. 2 of this report. Data indicates that rock is overlain from between 1 to 9 metres of sand. The upper sand layers have been formed by aeolian activity and are derived from a sandy till material which overlies bedrock. Low dunes are present on the site in places. The sand is brown when oxidized and is usually fine grained and silty.

SITE HYDROGEOLOGY

The March Formation is a major aquifer with a relatively high transmissivity, which often displays both a fracture and intragranular permeability. The sand materials on the site are also permeable, which indicates that the risk of groundwater contamination on the site is high.

It is likely that the watertable is within 1.5 m of the ground surface for most of the year and a slight northwest gradient is indicated in the unconfined sand materials.

Vertical gradients likely exist between the surficial and bedrock flow systems.

RESULTS OF PREVIOUS INVESTIGATIONS

An investigation of the site was conducted by I. V. Pitts of the Ministry of Environment in September 1977. The terms of reference for a hydrogeological study of the site were defined in April 1978, by Mr. Cy Holland (hydrogeologist M.O.E.). However, a study was not carried out at this time. In July 1980, an investigation (Mr. T. A. Mclelwain, hydrogeologist M.O.E.) was made of a bedrock aquifer contamination complaint. His conclusions and recommendations read as follows.

> "It is concluded by the writer that contamination of the bedrock aquifer in the area is occurring as a result of contaminated surface water entering the highly fissured bedrock north of the MacDougall waste disposal site. It is felt that this source and possibly other sources of aquifer contamination may have led to the contamination of the Steenwyick well, and possibly the Cutway well.
>
> It is recommended that a thorough inspection of the MacDougall property and the surrounding area be conducted to identify and eliminate all sources of contaminants gaining access to the aquifer".

During September 1980, a hydrogeological investigation of the site was conducted by Morrison Beatty Ltd. of Etobicoke, Ontario. It is understood that 10 shallow standpipes were installed at the site to monitor flow in the unconfined aquifer. The results of this investigation were unavailable at the time of writing.

CONCLUSIONS

Liquid industrial wastes were disposed of at the site for an 11 year period. The quantities and type of chemicals dumped at the site are unknown, but may include ethylene chloride, toluol, inks and laquer materials.

It is likely that these materials infiltrated the thin sandy surficial materials and entered the bedrock March Formation, which underlies the site. Some evidence exists that 2 of the 4 wells which are adjacent to the site may have been contaminated by effluent movement.

RECOMMENDATIONS

It is recommended that the findings of the Morrison Beatty Report be reviewed in detail before any additional monitoring work is undertaken. In the long term, the possibility of bedrock aquifer contamination should be established and adjacent well waters should be analyzed in a comprehensive manner (i.e. for organic chemicals as well as inorganic elements) on a suitable regular basis.

The disposal site and future uses should be permanently identified as follows:

(a) identify the "limits of fill" on the Official Plan,

(b) amend the Zoning By-law for the disposal site to restrict future uses,

(c) register a Notice on the title of the property with the Land Registrar which identifies the disposal site, the potential impacts and the restricted future uses,

(d) prohibit future residential development on the disposal site and a limited buffer zone around this site.

MINISTRY OF THE ENVIRONMENT

INDUSTRIAL WASTE SITE IDENTIFICATION STUDY

METADA LTD. SITE GLOUCESTER TWP.

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LIMITED

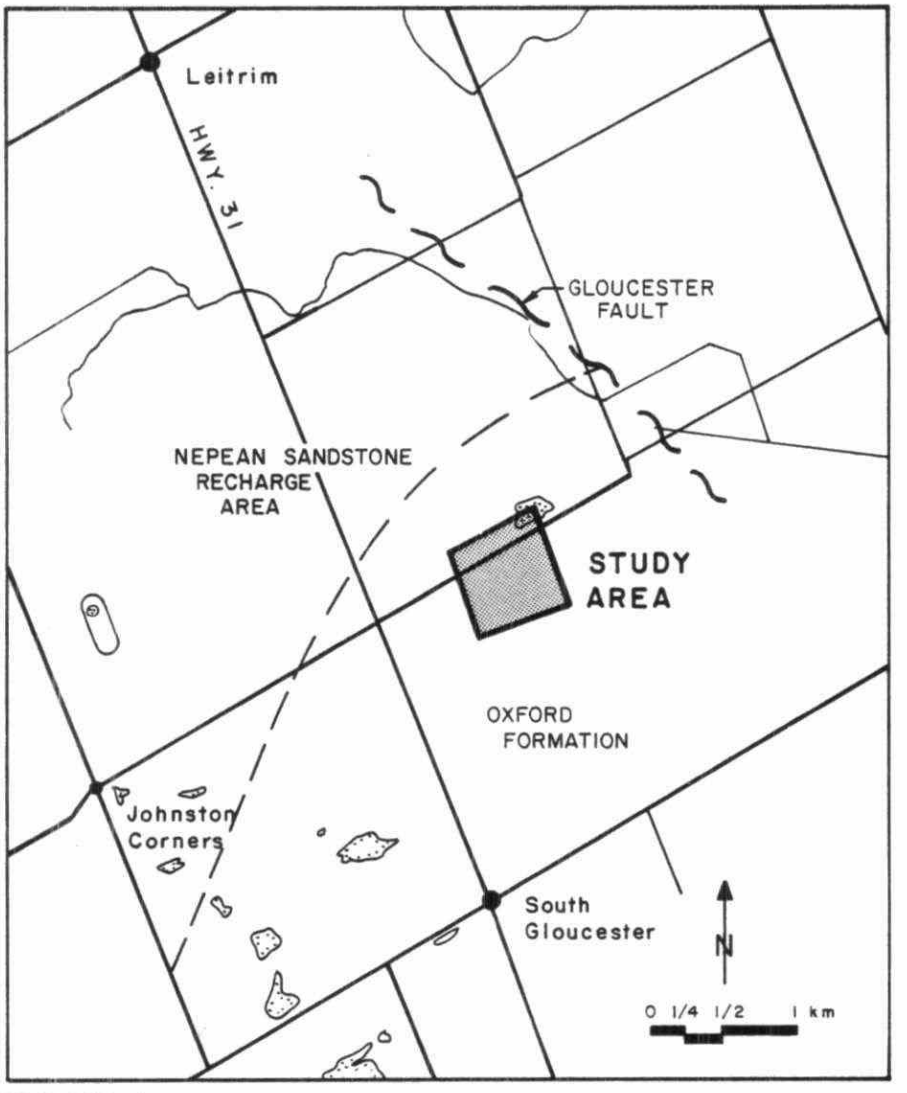
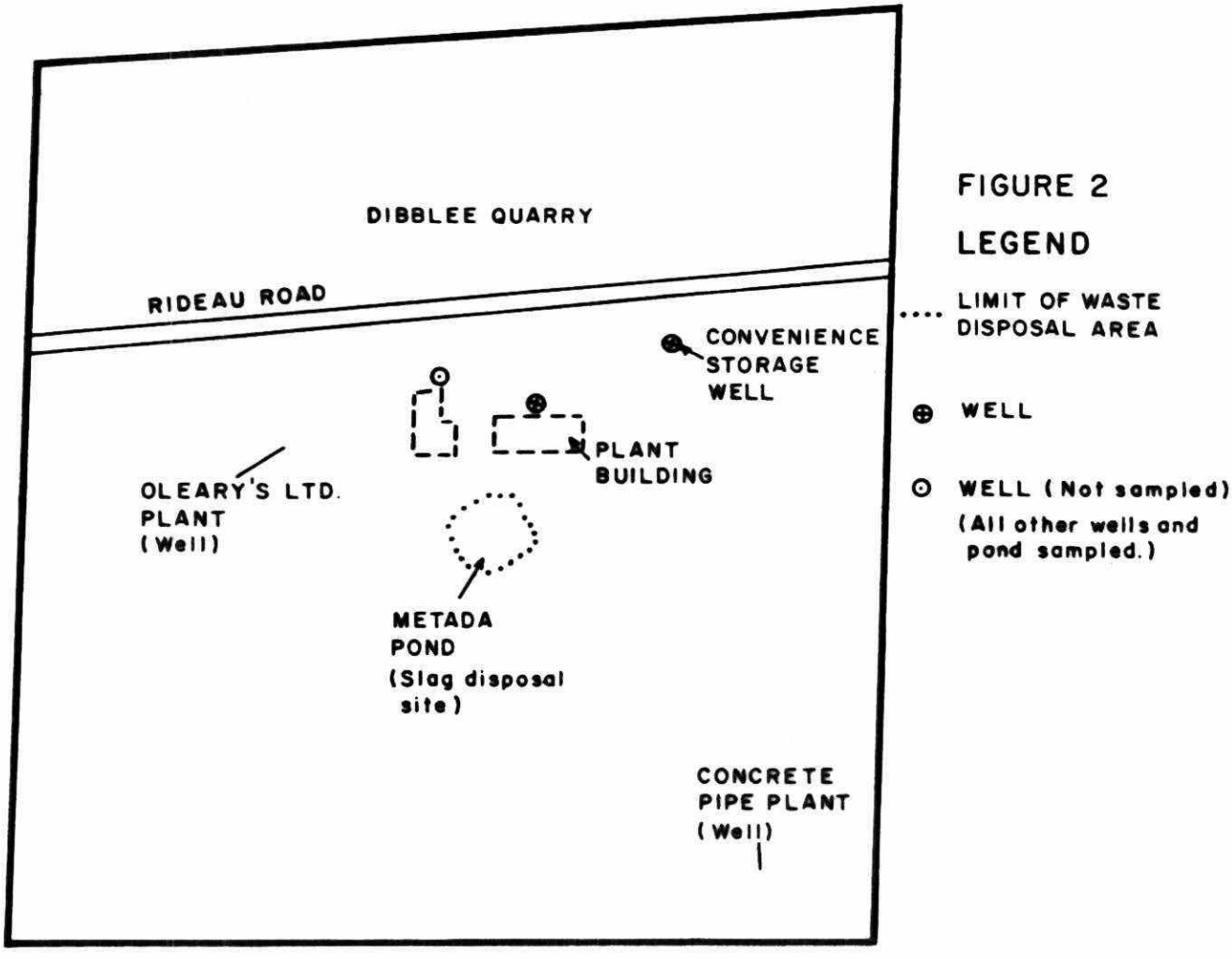


FIGURE 1

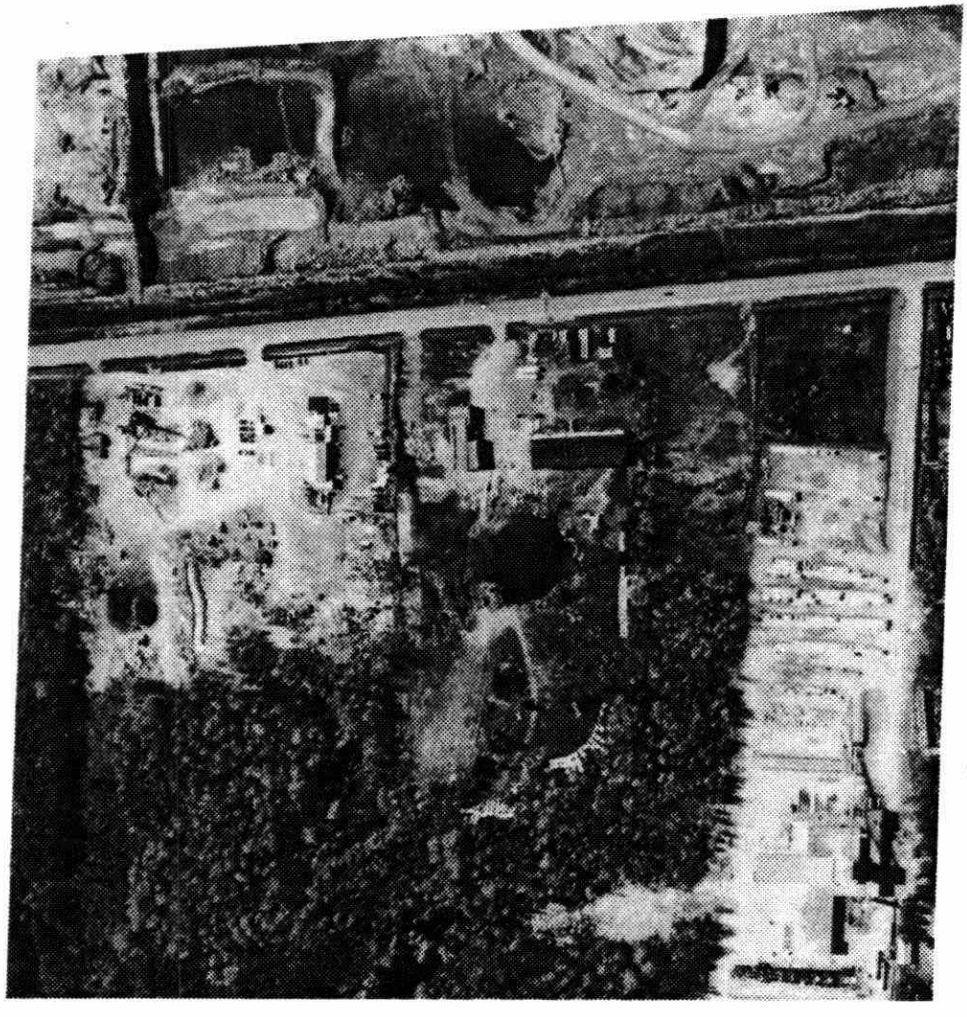
LOCATION MAP

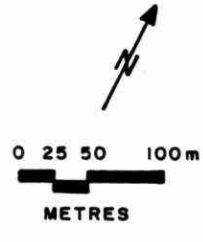
METADA LTD. SITE


DIBBLEE QUARRY
RIDEAU ROAD
CONVENIENCE STORAGE WELL
PLANT BUILDING
OLEARY'S LTD. PLANT (Well)
METADA POND (Slag disposal site)
CONCRETE PIPE PLANT (Well)
FIGURE 2
LEGEND
LIMIT OF WASTE DISPOSAL AREA
WELL
WELL (Not sampled)
(All other wells and pond sampled.)

Ontario

MINISTRY OF THE ENVIRONMENT





METADA LTD. SITE

WATER AND EARTH SCIENCE ASSOCIATES LTD.

GORE & STORRIE LTD.

METADA LTD. SITE

LOCATION - This site is located on Rideau Road in the Gloucester Industrial Park (Figure No. 1).

OWNER - Mr. Clarence Sheehan, Ottawa

SITE HISTORY

The actual operation dates of the Metada Ltd. plant were between 1965 and 1969. Two buildings, an office and a plant building (Figure No. 2) are located on the site. Each has a well. As a waste product of an industrial plant process which produced ferroalloys for the steel industry, approximately 800 imperial tons of a green resinous glass slag were piled immediately south of the plant building. The slag originated from a pyrochlore, molybdenum and vanadium ore. The following trace elements are contained in this material which have a potential to enter groundwater flow regimes on the site, due to leaching processes; iron, manganese, vanadium, niobium, arsenic and molybdenum. In addition, the slag produces a leachate with low level radioactivity concentrations.

The slag was removed from the site in 1976 or 1977 and a shallow water filled pond was excavated during the removal operation.

PREVIOUS INVESTIGATIONS

The site has been investigated and monitored by the Ottawa Branch of the Ministry of the Environment since 1975. The historical analytical data which is pertinent to this study is summarized on Table No. 1.

In November 1976, a research study was done by Mr. N. Saint Martin of the Federal Department of Energy, Mines and Resources to determine whether radioactive contamination was being released by the slags.

His report, "provides information on

> the rain-leaching tests of Gloucester Township slag samples and gives an estimate of the amounts of uranium, radium-226, and thorium that could be released to the environment as a result of a rather long-term rain-leaching process. Although all the leach liquors showed Ra-226 concentrations exceeding 3 pCi/l, in reality, the radioactive material would be released gradually".

TABLE NO. 1

MINISTRY OF THE ENVIRONMENT HISTORICAL ANALYSES

Metada well	July 10, 1975	Arsenic	<1 PPb
Metada office well	Sept. 30, 1975	Arsenic	<1 PPb
Metada plant well	Sept. 30, 1975	Arsenic	12 PPb
Metada surface water	Sept. 30, 1975	Arsenic	<1 PPb
Metada surface water	Sept. 30, 1975	Arsenic	<1 PPb
3 Grab samples, south of plant building	Oct. 2, 1975	Arsenic	2.0, 11.0, 11.0 PPm in soil
Concrete Pipe Ltd.	Dec. 6, 1979	Molybdenum	10.0 PPm
O'Learys Ltd.	Dec. 6, 1979	Molybdenum	0.33 PPm

There have been no specific previous hydrogeological studies of the hydrogeology of the Metada Ltd. site. However, numerous studies have been conducted to evaluate arsenic and salt groundwater contamination problems on adjacent properties. These studies were summarized in 1979 by Water & Earth Science Associates Ltd., for an individual correction services project of the South Gloucester area. (Report on Private Services, Oliver, Mangione & McCalla Ltd., Ottawa 1979).

SITE GEOLOGY

The South Gloucester area is underlain by three bedrock formations of Paleozoic Age which overlie a basement complex of Precambrian Shield rocks. The Nepean sandstone is the oldest of these units and is overlain in turn by a thin

transitional sequency of dolomite and sandstone called the March Formation and the Oxford Formation dolomite. The Oxford Formation outcrops at the ground surface in many places around the Metada site and is quarried and crushed in several pits. Excellent exposures of the March and Nepean units are present in road cuts along Rideau Road near Beaver Asphalt (Ontario) Ltd. Just west of the study area, overburden is thin and discontinuous and is composed mainly of sand and brick, concrete and pebbley fill materials.

The stratigraphy of the South Gloucester area is summarized in Table No. 2 at the end of this section, to provide a framework for the discussions of the hydrogeology which follows.

The contact between the Oxford and March Formations is defined as the first stratum of sand encountered in the black Oxford dolomite (Wilson 1964). The March-Nepean Formation contact is placed at the lowest dolomitic layer in the March Formation (Wilson 1964).

STRUCTURAL GEOLOGY

The Metada site lies southwest of the Gloucester Fault, a major northwest to southeast trending structural break in the Palsozoic rocks of this region. The fault trace is expressed at the surface by a small escarpment east of Beaver Asphalt (Ontario) Ltd. on Rideau Road (Figure No. 3) less than 0.5 m east of the Metada site.

Near surface exposures of the Oxford Formation appear almost flat lying throughout the study area, although minor flexures of these units have caused 5 degree northerly or southerly dips in places. Drilling results reveal that strata strike approximately in an east-west direction with a slight regional dip of 1 to 2 degrees. All three formations and their aquifers reflect this bedrock attitude.

FIELD OBSERVATIONS AND ECOLOGICAL SENSITIVITY

Some pieces of green glass material (molybdenum slag) are still present, scattered around the pond area. The site is highly man altered and the surficial materials are essentially a brick, asphalt and cement fill at present. There is some algal growth in the shallow pond which suggests that the water body is eutrophic. The site is not ecologically sensitive in any way in its present state.

SITE TOPOGRAPHY

The Metada site is essentially flat with the lack of topotgaphy controlled by the upper bedrock surface. A shallow pond located behind the buildings on the site is apparently less than 1 m in depth. The Dibblee quarry across Rideau Road to the north of the site and the Bertrand quarry south of the site are major man-made topographic features close to the site.

SITE VEGETATION

The site is unvegetated except for hedgerows along the southeast and western property boundaries. These are of naturally poor quality, due to the thin nature of the soil.

GROUNDWATER FLOW

Groundwater flow in bedrock aquifers is primarily through fractures, joints and bedding planes under the influence of gravity from topographically high areas towards discharge at lower elevations.

A review of the hydrogeolical work previously conducted in this area reveals the following important points.

A) Flow Systems

Two distinct flow systems are present in this area. Near the Metada site, groundwater flow is to the southeast in both the Nepean and Oxford aquifers. A large capacity well, located at the Domtar plant at the

corner of Rideau Road and Highway No. 31, is drawing water from the upper Nepean Formation at a minimum 6 ℓ/second rate. There is some question whether the hydraulic gradient in the Nepean aquifer has been reversed by the Domtar well. Mr. Bob Stiles (M.O.E. Ottawa) has accumulated data which reveals that a northwesterly and northern movement of arsenic and molybdenum has occurred from the Masterloy waste disposal site (southeast of the Metada site, see sketch map in Appendix A).

B) Aquifer Interconnection

A steep vertical component of groundwater flow exists in the Oxford Formation. However, the Oxford is not hydraulically connected to the underlying Nepean Formation, based on test drilling and pump testing. (Water & Earth Science Associates Ltd., South Gloucester Individual Connection Study, 1979). Geological observations made in the quarries near the Metada site support this conclusion.

C) Well Construction

Shallow wells in the Oxford Formation are rapidly recharged with surface runoff water along Highway No. 31 west of the Metada site.

An inventory of all the wells in the South Gloucester industrial park is included as Appendix A of this section, with a sketch map of their location. Information about arsenic, bacterial and chloride contamination in these wells is also presented.

Of a total of 28 wells in the Industrial Park, only 2 are definitely cement grouted and cased properly into bedrock. These are the Capital City Tractors and Domtar wells. All others have a high potential to become contaminated due to the poor well constructions used. Even recently constructed wells (Convenience Storage Ltd.) are ungrouted.

D) Recharge Area, Nepean Aquifer

The recharge area for the Nepean Aquifer is shown on the location map, Figure No. 1, as defined by a search of over 140 well logs in this area.

GAS TESTING

Due to the physical nature of the site and the fact that the waste materials have been removed from the site, gas testing was not conducted.

LEACHATE AND WELL WATER TESTING

The results of field chemistry analyses are included as Appendix B. There are indications of leachate at the surface on the site.

After a review of the Metada Ltd. process information, it was decided to analyze the Metada well and pond, Convenience Storage well, Concrete Pipe well and O'Leary's Ltd. well for a series of radioactive and trace elements. Results are included as Table Nos. 3 and 4. The radioactive analyses were conducted by Dr. Don Wiles of Carleton University and the trace elements by Bondar and Clegg Ltd. of Ottawa.

All radioactivity samples are extremely low and are considered to be within background levels. The trace element analyses show only one anomalous result, a high molybdenum concentration of 10.9 mg/l in the Concrete Pipe well. A 10.0 PPm concentration was present in this well on December 6, 1979. Although Concrete Pipe is located southwest (i.e. downgradient) from the Metada pond/disposal site, the Masterloy disposal site southeast of the study area, is the likely contamination source. The well has only 7 inches of ungrouted casing, is 64 m deep and taps the Nepean Aquifer. The well has shown arsenic contamination associated with the Masterloy site consistently in the past and is not used for human consumption.

CONCLUSIONS

Routine monitoring of a number of wells in the Gloucester Industrial Park is being carried out by the Ottawa office of the Ministry of the Environment. The molybdenum levels in the Concrete Pipe Ltd. well should be monitored as part of this program and the human consumption of this water, which is already prohibited, should not be permitted.

RECOMMENDATIONS

There are no serious environmental problems at the site and further work is not recommended.

TABLE NO. 2

STRATIGRAPHIC SUMMARY CHART, METADA SITE

TIME	FORMATION	LITHOLOGY	DEPOSITIONAL HISTORY	REMARKS
CENOZOIC ERA PLEISTOCENE PERIOD	Unconsolidated Surficial Materials	brown and grey coarse grained sand and gravel, dolomite and granitic pebbles	Champlain Sea deposit (10-12,000 years old)	less than 1 m thick
		NONCONFORMITY		
PALEOZOIC ERA	Oxford Formation	argillaceous dolomite	ancient marine sea deposit, 23.5 metres thick	upper strata exposed in Bertrand Quarry
	March Formation	dolomite & sandstone	as above, 12.5 metres thick	exposed along Rideau Rd. at Beaver Ashpalt Ltd.
	Nepean Formation	sandstone	as above, total thickness unknown	exposed near Beaver Asphalt Ltd., east of Metada
		NONCONFORMITY		
PRE-CAMBRIAN	Grenville Province	metamorphosed granitic and related rocks	forms basement complex	not exposed in study area

TABLE NO. 3

TRACE ELEMENT ANALYSES - METADA LTD SITE
(in mg/ℓ unless noted)

Sample Location	Arsenic	Iron	Manganese	Molybdenum	Vanadium	Conductivity (uMHos/cm)	pH Units
Convenience Storage Ltd. Well	.02	.05	.05	1.12	<.01	700	7.50
O'Leary's Ltd. Well	.02	.10	.05	.33	<.01	650	7.50
Concrete Pipe Ltd. Well	.02	.05	.05	10.9	<.02	480	7.45
Metada Ltd. Well	.02	.20	.40	0.37	.01	700	7.45
Metada Ltd. Pond	.02	1.90	.10	0.13	<.01	390	8.50

TABLE NO. 4

RADIOACTIVITY ANALYSES - METADA SITE

Sample Location	Radium 226	Thorium 232	Thorium 230	Gross Alpha	Gross Beta
Convenience Storage Ltd. Well	1	<1	N.D.	N.D.	N.D.
O'Leary's Ltd. Well	1	2	N.D.	N.D.	N.D.
Concrete Pipe Ltd. Well	1	N.D.	N.D.	N.D.	N.D.
Metada Ltd. Well	1	N.D.	N.D.	N.D.	N.D.
Metada Ltd. Pond	<1	N.D.	N.D.	N.D.	N.D.

N.D. - not detected

Measurements in picocurries/litre

APPENDIX A

WELL INVENTORY - GLOUCESTER INDUSTRIAL PARK

SOUTH GLOUCESTER INDUSTRIAL PARK

TOWNSHIP OF GLOUCESTER LOT 26 & NORTH ½ LOT 27 CONC. 5,

WELL LOCATIONS (×) AND COMPANY NAMES

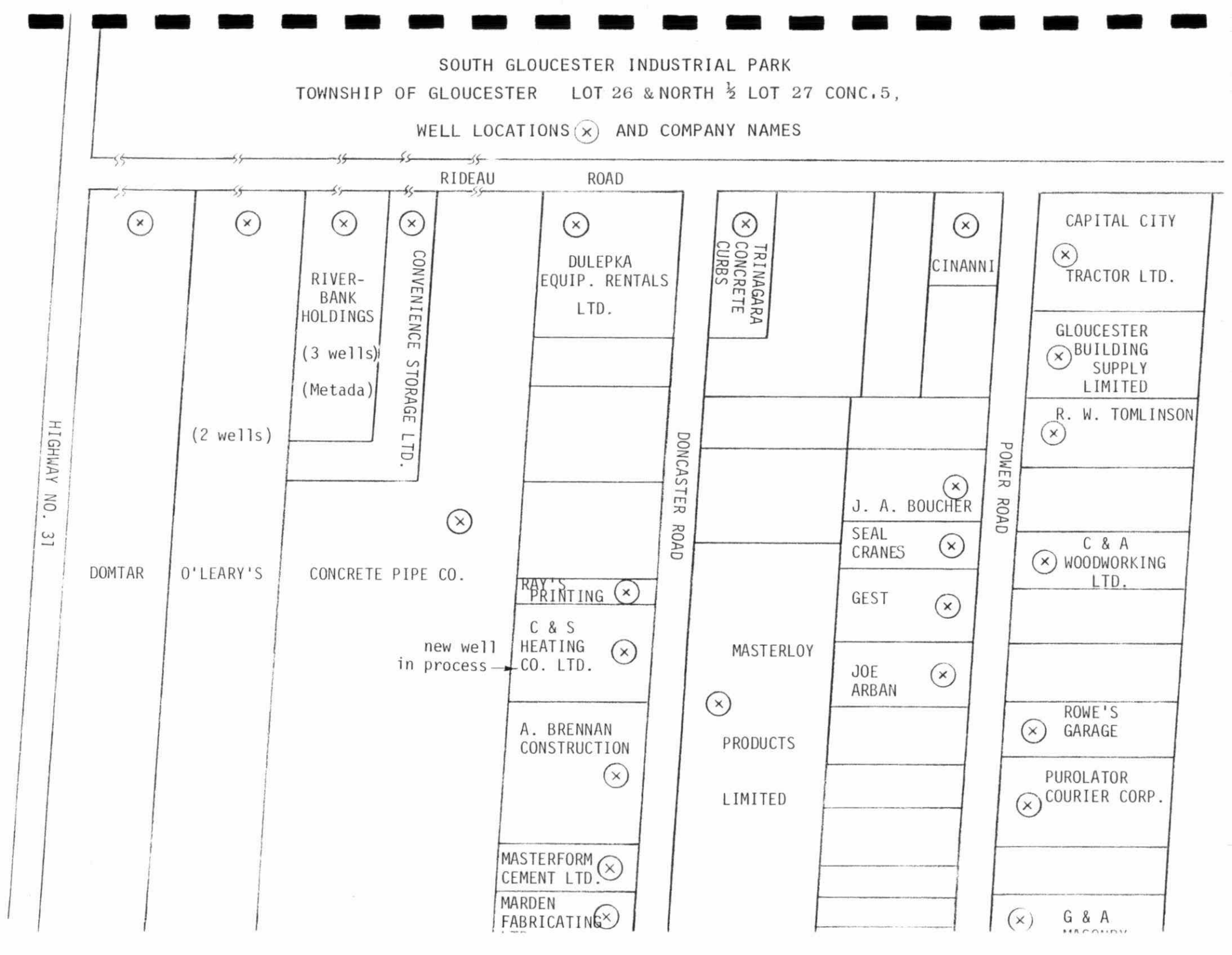


TABLE NO. 1

SUMMARY OF WELL RECORDS

SOUTH GLOUCESTER INDUSTRIAL PARK

Company Name	Well Depth feet	Casing Length feet	Static Level feet	Pumping Level feet	Arsenic Detected x-1-50 ppb *over 50 ppb	Other Contaminants
Arban J.	125	22	55	110	*	-
Beaver Asphalt	186	18	36	100		High bacterial count
Boucher J.A.	105	20	65	70		High slightly chloride
Brennan Art	65	19	34	60	*	-
C&A Woodworking	123	21	75	100		-
Capital City Tractors	250	190	-	-		-
Cinanni M. (Hub Inst.)	123	22	36	79		-
Concrete Pipe	212	23	55	120	*	-
Contract Const. Services (Gest)	123	20	15	75	not sampled	-
D'Angelo Asphalt (Tomlinson)	98	20	20	80		-
Domtar	250	148	65	200		-
Gloucester Bldg. Supplies	125	35	51	100		-
Marden Fabricating	170	21	70	150		High bacterial count
Masterform Cement	123	21	20	75	*	-
Masterloy Ltd.	230	22	73	150	*	-
Metada	78	16	18	70	x	-
(Riverbank	188	18	60	150		-
Holdings)	148	22	35	125	*	-
O'Leary's	120	17	15	25		-
	120	20	65	118		-
Purolator Courier	133	13	25	90		-
Ray's Printing	125	11	25	70	*	-
Seal Cranes	95	22	20	75		-
Duleplla	No data, new well				*	-
C&S Heating	New well					-
Trinagra	No data					Unknown
G&A Masonry	No data					Unknown
Rowes Garage	No data					Unknown
Convenience Storage Ltd.	No data					

APPENDIX B

FIELD ANALYSIS SHEET

Ministry of the Environment
Ontario

LABORATORY ANALYSIS

FORM 1
Industrial Site Identification Study

MOE Region Southeastern Date Oct.29/80 Company Name Water & Earth Science Associates Ltd. and Gore & Storrie Limited

Site Metada Ltd. Site
(Lot, concession #, or UTM coordinates, name, address)

1 Leachate

ON-SITE TESTS

A. Water bodies within 100 Metres

Parameter	Pond Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides	62.5									
2) TDS	-									
3) Suspended Solids	-									
4) Alkalinity	268									
5) Conductivity	400									
6) pH	7.5									
7) Hardness	235									
8) Sulphates	-									
9) Iron	.04									
10) Colour	low									
Odour	nil									

B. Wells within 100 Metres

Concrete Pipe Co.

Parameter	Building 2 Results 1	2	3	4	5	6	7	8	9	10
1) Chlorides	137.5			275						
2) TDS										
3) Suspended Solids										
4) Alkalinity	513			462						
5) Conductivity	700			1280						
6) pH	745			7.5						
7) Hardness	598			1110						
8) Sulphates	140									
9) Iron	.05			.14						
10) Colour	nil			nil						
Odour	nil			nil						

Lab Tests (2 Litre Samples)

Required, Yes X No _____ If yes , complete Form II,Lab Analysis. If no,go to Part 2, Gas.

2 Gas

C. On-site None; waste removed from site

D. Buildings

Test Holes	CH_4			Name/Address	CH_4		
#1				1.			
#2				2.			
#3				3.			
#4				4.			
#5				5.			

3 General Coments (vegetation, leachate springs, depth, odours, etc.)

Scattered green glass waste on ground. Some algal growth in pond indicates eutrophication; iron scrap, ashpalt, bricks, cement on ground.

(Detail all test point locations in a sketch on reverse side)

Form completed by D. P. Smith

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